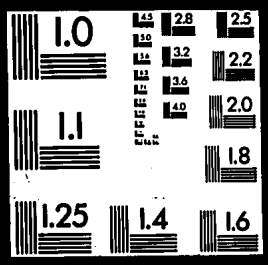
CENTIMETERS



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Thomas A. Edison Papers

A SELECTIVE MICROFILM EDITION
PART V
(1911–1919)

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A Note on the Sources

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NOTEBOOK SERIES
NOTEBOOKS BY EDISON

Notebook Series -- Notebooks by Edison
Notebook, N-19-04-20.2

This notebook was used by Edison in April 1919 for experiments with electromotograph cylinders and chemically treated papers. Included is a list of substances tried as molded cylinders in an electromotograph (chalk) telephone, along with notes on the relative sensitivity of various recording papers. The entries in this book relate to those in N-19-04-23.2 and also to one of the 1919 entries in N-08-02-13 (*Thomas A. Edison Papers: A Selective Microfilm Edition*, Part IV, 168:551-685). The front cover is marked "Scientific Experiments April 20 1919." The pages are unnumbered. Only 9 pages have been used.

List of substances as powders moulded in cylinders tried on chalk Telephone with measuring box

Bell Receiver connected to Amberol Phone, 3 stage and 15000 ohm in phone ckt used ear tubes,

	Emg	Bell
Strontium Carbonate	30	18
Kunzite	22	
Tungstate Calcium	20	
China Clay	Crumbles	
Rotten Stone	00	
Strontium Oxide	4	
Lithium Phosphate	Sufficient	
Bismuth Oxide	Valor	
Uranate Soda	"	
Cadmium Oxide	"	
Native Magnesium Silicate	"	cals
" W Va Limestone	00	
Aluminium Hydroxide (bought)	30	
Lithophone	6	
Tungstic acid	4	
Strontium Oxide	16	
Mag Ammon Phosphate	8	
Sodium Arsenate	0	

	Eucq	Fzell
Barium Antimoniate	10	
Silica	12	
Ferric oxide from [illegible]	8	
Blanc fix	2	
Potash alum	0	
Nickel ox [illegible]	8	
Calcium Hydrox	8	
Lead Hydrox	0	
Mercuric hydrox	12 -	
Bismuth hydroxide	[illegible]	
Magnesium Hydrox	30	
Zinc "	26	
Stannous "	0	[illegible]
Cupric "	0	
Cobaltic "	4	
Ferrate of Barium	1	
Manganic hydrox	0	
Carb Sodata	10	100 [illegible] Carb Na
Magnesium Sulphate	12	16
" Oxalate	0	
" Chlorate	12	
" Acetate	0	
Ni Amm Sulphate	0	
Copper Carb	0	
Litharge	0	

	Box	Roll
Lead phosphate	0	
Calcium Ferrocyanide	28	16
Red Ox Mercury	22	
Lead Sulphate	0	6
Colloidal Fe_2O_3	0	
Iron by H.		
Barium Hydrox	2	
Light Calcined Magnesia	26	
Magnesia Fluoride	30	
Calcium Citrate	0	
Zinc Oxide	12	
Calcium Sulphide	6	
Strontia Salicylate	0	
Ferric Borate	8	
Strontia Oxalate	38	16
Magnesium Carb	12	
Barium Phosphate	16	
Calcium Arsenate	26	
Calcium Oxalate	32	
Calcium Sulphate	2	
Chromate Calcium	20	
Zinc Carb	0	20
Strontia Fluoride	10	
" Sulphate	4	
Ferrous Phosphate	14	

	Box	Field
Manganese Borate	5	
Black [illegible]	28	
Houston [illegible]	28	
Aluminum Chromate	[illegible]	
Bismuth [illegible]	2	
[illegible]	0	
Bismuth [illegible]	0	
[illegible]	[illegible]	
Calcium Titanate	34	
[illegible]	0	
Manganese Carb	0	
[illegible]	0	
Iron Sulphide	0	
[illegible]	8	
Zinc Sulphate	[illegible]	
Stibnite Antimonite	20	
" Arsenate	20	
Manganese Carb	14	
Iron Carb ?	2	
Nickel Oxalate	0	
Lithium [illegible]	no Less	
Magnesium Sulphate	0	
[illegible]	0	
[illegible]	0	

Box

Amandaphandi Chupaceolis 0

Cuprous Oxide → 32 Spec 20

April 25

Chemical Recording paper

rough preliminary Experiments

	Relative Sensitiveness
Iodide K	100
p-Amidophenol Hydrochloride + KCl	75
Aniline Hydrochloride + KCl	160
O-paraphenylenediamine + KCl	65
Phenolphthalein + KCl	50
p-Amidophenol + K Chlorate	78
Pyrogallic acid + KCl	20

I think p-amidophenol can be improved to 100, work seems to be permanent.

Tellurium point, (Cathode) 80, on Platina
" Cathode on Zinc 125

1.25 Volt z Iodide - Can't get work
Throw 500 000 Ohm W Elec graphite
Rods in Tubes on Te or Iodide K

The Te with Zinc Chloride -

~~KOH, Soda~~ NaOH 20% with Te pen pink mark without Current + ng on No Res —
Te

Sr Cl. no gain -
Phos Soda Electrolyte No gain
Carb Soda, No gain

I wet a Stroulman Carb cylinder with KCl strong hard Endorse on Zinc plate, Makes with all Carbon Res in + no deflection of Microammeter Very fine narrow hair like Black mark

This is a great improvement over paper, much more sensitive Concentration of action to a fine point probably doubles or trebles sensitiveness, Possibly Tritiy of Aluminum will be better as it will not wear point mechanically

It only wants a very slight pressure

The K forms K Telluride which is nearly instantly decomposed by the air — Or Telluretted Hydrogen which does same thing —

Paper wet with NaOH, gives purple mark without Current + dont decompose in air apparently ~~with~~

I think some of the black Mark of Te pen on $SrCO_3$ is due to grinding off Te as I get a mark without Current but weak, it will require a hydrate like Trihyd Aluminum —

Just tried cylinder Aluminum trihydrox gives no mark without Current, OK with Current,

When I wet $Al_2O_3(OH)_x$ I heard it Crack — used KCl fairly Concentrated

Probably a Chock cylinder
Can be wet with thick $Al_2O_3 H_2O$
like a Vermark & be based Enough

Notebook Series -- Notebooks by Edison
Notebook, N-19-04-22

This notebook was used by Edison in April 1919. The entries relate to the preparation of iron mix for use in the negative electrode pockets of storage batteries; the mix was made from pure iron and 3 percent yellow mercuric oxide. Included are experiments performed on red iron oxide identified as "giving us trouble at factory." Other experiments involve the iron sulphate used in the production of that iron oxide. Also included are reminders to direct "Miller" (probably Edison's brother-in-law John V. Miller, manager of the Edison Chemical Works) to perform tasks or collect information, along with a list of matters to investigate further. One entry summarizes the results from storage battery tests recorded "from old books," one of which was N-19-04-20.1. The front cover is labeled "Very Important," "Iron Mix Experiments," and "April 22 1919." The pages are unnumbered. Only 18 pages have been used.

April 22

1= Set up device, after screening large pieces of Red Ox to size to crush several particles one at time to ascertain density -

2= Is red iron tested for Sulphates, if sulphur left it binds + makes particles less porous -

3 Is hydraulic presses daily Checked at Orange - also small press -

4 - Is our Manganese test reliable.

		High	Low
5. Average Lwts	Slake	17.6	13.3
	Orange	29.1	18.5

Supposed both machines alike - Why such diference on same batch of mix

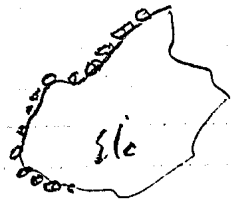
6 = What is method of quick testing for Mn –

7 = Does accumulator weights vibrate in pressing pockets

8 What has become of test of A4 without Corrugating This was ordered 2½ months ago – I never get any reports of test Coils although over a dozen tests of various kind were ordered, Why –

9 On washing red iron & washing away the very fine, I find on drying that at least 15% of the lumps when broken show steel like Colors & not red, Outside is red

10 – On washing acct fines from iron mix & then drying I find that the outside of lumps has fused iron globules from high temperature.



Either this is iron or a fused impurity oozing out – or Mercury If iron its inert.

11 I find that the washed Mix – using distilled water & residue on watch glass that when dried the particles of mix are cloaked together by Ferric hydroxide, which is not only inert but is an insulator – apparently on self heating no water should

be used except in a very fine fog — any great amount will on evaporation cover the finer particles with ferric hydroxide & insulate them —

I washed the mix with very dilute NaOH, on drying there is no ferric hydroxide & all is black

Am trying it with Ammonia — tried no ferric hyd black, no residue this is ideal if ok otherwise —

Miller should keep 3 months supply Rockets 5 + 7 gram & preserve ½ dog for future Examination —

Roasted Ferrous Sulphate does not turn green when put in water —

10 grms Mny soaked in distilled water, then filtered gives a white residue on evaporation on watch glass. about 2 milgrms -

Find out record of A 4 Cells on test without Corrugating -

ditto Cells which have no Nickel plating on any part,

See if Miller has small evaporating apparatus & roasting dish & have him make batches.

90 $FeSO_4$ 10 Mg Sulfate
90 " 30
50 " 50

Drive off water from Crystals
Roast reduce self heat
& make test pkts.

Miller take some reg mix before
self heat & self heat with 1/2 of
% of NaOH another
lot 1% Ammonia —
If he can't do this but must
use pat full do that,
Put in H_2O after self heated
& cold —

Quakies roasted Sulphate
has very few fines & that it
granulates - 95% thru 40 mesh
& the fines are 60 mesh
hardly trace of 150 mesh

This could be aged & roasted
stopping fines & chunk -

Jack Rea Red iron roasted
4 hours which is now giving
us trouble at factory giving
only 1400 to 5 grams
This red has lot of black particles
in it - On 20 mesh has the
most should say 20%
on 40 has 10% on 180 dont
show any.
Probability is that nearly
all is that thru 80 mesh
hard any - by washing
the on 20 mesh with fingers

treated on big watch glass
the red is gradually washed
away it being more spongy
While the black to brown is
very much harder & dense
Under Microscope the black
shows very fine globules in fact
its masses of globules showing
fusion, its otherwise
A lot which was roasted
3 hours & also a lot
2 3/4 hours gave no black
particles by rubbing on
watch glass -

The best way to bring
out black is to take several
grams ~~[illegible]~~ size & then fuse
in Coro HCl at a gentle
heat until 3/4 has ~~[illegible]~~
dissolved leaving then
the black is easily seen
as its not affected as
Easily as the Red
3 hours or 2 3/4 hours

roast is best,

The 3 hour roast will be more friable than 4 hours, hence after being reduced by hydrogen the Chilean mill should be run only enough to bring the right fine for loading — that is now 20 minutes no matter what the friability of roast is. If friable 20 minutes will make it so fine cant load it. Whereas if the mixing time is gauged by screening the mix. 3 5 & 10 minutes the mill will bring it to right mesh so most friable ores will load

The dried sulphate should be screened thru 5 mesh as the big particles that gross most black

I notice in 10 hours –
5/16 + smaller Sulphate at
a very gentle heat.
2 bottles dishes one on top
of the other. quite fully
dehydrated (10) 6 waters
+ very porous + white
not oxidized — This white
seems strong enough &
can be heated right up to
red without puffing —

Think a shelf drying
Room with heat + good
ventilation will do it
perfectly without making
fines to bother

I put some $FeSO_4$ Crystal 1/4" of them in Vac Dryer 26" Hg — 1 hour and temp, did nothing —

Put in 1 hour at 160° Fahr whitened around edges, probably if 1/4 it would be finished in 3 hours — This Experiment is no I think because we used a water pump & bottle ~~[illegible]~~ wants a pump —

In Open butter dish 2 high (10) on on top of the other I put on hot plate with $FeSO_4$ Crystals 1/8 thick then 8 mesh at 3 pm it was dehydrated & all white throughout, laid thermometer in the granules & resting on dish gives 58° — Centigrade — air perfectly still. The lumps are not friable & will stand a lot without making fines — Put right on red hot plates screen 0004 Bunsen burner dont melt —

If 1/8 mesh stuff is put say 1/4 thick on shelves in room at 60 cent & the air freely circulated The whole will be OK in 3 to 4 hours,

If Rotary dryer used, can use it Blow Rest & do same thing. but not so perfect.

By using 1/8" Crystals the surface is increased many times over what we have now & the drying time enormously diminished

I find that iron by H. taken out of pot wet & dried in thin layer on pie plate at ordinary temperature

is litterally covered with yellow ferric hydroxide, This is very bad.

There is now doubt but what in our present process of self healing we make from 5 to 10% of ferric hydrox which is irreducible electrically an insulator This hydrox is not only on surface of the particles but must be in the pores

I suggest ~~[illegible]~~ Centrifuging to get off all the water possible & drying in air

Possibly washing with alcohol to remove remaining water

Or Centrifuging & having NaOH in water put in pat originally

Displacing the water
by Denatured alcohol
it still dries Reddish
Showing Denat alcohol
will not do —

So far the NaOH is ok
but not yet dry -

The dried Reduced by H +
water in pot,
I pressed this considerably
in bottom of pie dish
to break up big lumps
after that screened it —
Most was on 20 mesh
2nd on 60 — 3rd on 100
+ very little thru 170
+ all brownish red

Took some of the on 20 mesh ground fine + it became black, showing most of the ferric hydrox is on the surface —

There is now doubt that no matter how friable the ore is, that by proper crushing of the reduced by H, there need not be many fines + that there should be no trouble to get easy loading mix by controlling degree of crushing —

April 29/19

Took 3 lots of Fr Leg H wet

I noticed red ferric on outside of dumps but black inside due to air getting in Can

Each lot I crumpled up & put in Beaker.

1st added 1/2 % NaOH + cor water
2 " 1 % "
3 " 2 % "

Let it soak for 15 min
poured water off left mix
Separating wet put out on
Watch glass 6" to dry
in Bench - at 3 pm -
at 6 pm only 1/2 dried, gone
for the day - probably 10 hours
to dry

after drying all night

all dry

½% NaOH, decidedly brown
some pieces gone cobally red

1% shade Brownish red

2% faint tint,
under microscope looks all
metallic Can't see any red

2½% NaOH, will certainly
do the business in the pot

NOTE

It would be an advantage I
think to get the particles a
little more porous, This
Could be done by screening
Then 8 mesh & air dry
warm air — of the FeSO4

NOTE

Record from old Books --
Bad tests when temp was poorly kept & tests unreliable
6 c/o Hg 5 gm Cakes iron
150 Runs

			1 V	½
Thru	20	mesh	1605	2432
"	30	"	1800 ?	—
"	40	"	1647	2550
"	60	"	1675	2505
"	80	"	1725	2572
"	100	"	1822	2640
"	180	"	1375	1990

50 Runs 6 c/o Hg 5 gm Cake

Thru	30	on 40	1075
	40	on 50	1380
	50	on 60	1372
	60	on 70	1572
	70	on 80	1295
	100	on 180	1880
Thru	180		1705

Notebook Series -- Notebooks by Edison
Notebook, N-19-04-23.2

This notebook was used during April-May 1919 and May 1920. The entries from 1919 are by Benjamin F. Sorin and pertain to his construction of pressed chalk cylinders and "buttons" for Edison's experiments. Each entry describes the composition and construction of a batch of cylinders, sometimes indicating when Ludwig F. (Louis) Ott or other laboratory employees supplied chemicals or materials and occasionally noting when the results were shown to Edison. The entries from 1920 are all by Edison and indicate that he "just returned to expmtg with chalk phone." The notes relate to experiments with electromotograph (chalk) telephones using different chalks in various circuits. Included are descriptions of experiments with manganese oxide chalks, some of them faced with various metallic washers, made with varying amounts of pressure. The entries indicate that Frederick P. Ott assisted Edison in some cases. Inserted into the book are notes by Edison, Sorin, and William W. Dinwiddie. The front cover is marked "Note Book." The book contains 100 numbered pages; pages 54-100 are blank.

Pressed chalk Cylinders.

Benjamin F Loun.

april - 23 - 1919.

81082
Acme Co.,
MFG. STATIONERS,
95 JOHN ST.
AND
19 PLATT ST.
NEW YORK.

Cabinet # 5. April-23-1919.

Pressed chalk cylinders.

Shelf # 1

Made 25 chalk cylinders for Mr J.A.E. by taking 5.8 grams of chalk and mixing with 4 drops of water, mixing well to distribute the moisture then putting in mould & pressing in hydraulic press up to (300 atoms) or 1650 on high reading gauge. Of course 1622 is the accurate figure for pressing but we couldn't get that reading on the gauge because it isn't graduated so fine so I took the nearest figure which is 1650.

Shelf # 2 Apr-24-1919

Made 25 cylinders of strontium Carbonate without using water 7/16" long. by taking 7.8 grams of strontium Carbonate and putting in die and pressing up to 1600 1625 on high reading gauge which make approximatly 360 atmospheres of pressure used.

Shelf #3 April-25-1919

Alumina Hydroxide.

Made 8 cylinders of alumina Hydroxide 7/16" Long by using 2.8 grams of alumina Hydrate and 500 lbs pressure on Large gauge. as per instruction of T.A.Edison.

Made 8 more cylinders of alumina Hydroxide by instruction of T.A.E. 13/32" Long by using 3.8 grams of alumina Hydroxide with 1000 lbs pressure on high reading gauge.

Tried to make 8 cylinders more for T.A.E. 13/32" Long by using 4.2 grams of Alumina Hydrate with 1500 lbs of pressure on high gauge with moisture & without but didnt succeed very well as they the buttons all cracked or chipped so you couldnt use them, showed most of them to Mr T.A.E. and he advised not to try and make any more.

Tryed it again & finally succeeded by using 4.2 gram alumina Hydrate with 8 drops of water 1500 lbs pressure & got a fairly good button

May-22-1918. made 5 buttons.

Shelf #4. april-29-1919

Light Calcined Magnesia

7/16" Long

Made 4 at 300 lbs pressure using 3.6 grams calcined magnesia without water

4 at 600 lbs using 4.3 grams calcined (mg) magnesia without water.

4 at 800 lbs using 4.8 grams Calcined Magnesia without water.

4 at 1200 lbs using 5.2 grams calcined Magnesia and using 4 drops of water.

4 at 1600 lbs using 5.5 grams calcined magnesia using 4 drops of water

5 at 2500 lbs using 5.8 grams of calcined magnesia using 5 drops of water.

Shelf 5 May 1st/11

Zinc Oxalate.

Made 8 cylinders of Zinc Oxalate by using 5.5 grams with 800 lbs pressure getting a button 7/16" long.

Made 8 more cylinders of Zinc oxalate by using 6.2 grams of with 1600 lbs pressure getting a button 7/16" long.

Made 9 more cylinders of Zinc oxalate by using 6.5 grams with 2500 lbs pressure getting a button 7/16" Long.

The buttons wouldn't stick very well so I used water as a binder as follows 5.5 grams 4 drops 6.2 grams 5 drops, 6.5 grams 6 drops after which I got a fairly good button.

The Zinc oxalate is the precipitate that was made by Louis Ott.

Shelf 6 May 5th.

Calcium Oxalate.

Made 5 cylinders of Calcium Oxalate by using 4. grams of Calcium Oxalate and 6 drops of water with 800 lbs pressure of which I got a fairly good button 7/16" long.

Made 5 cylinders of Calcium Oxalate of using 4.5 grams Calcium Oxalate and 6 drops of water with 1600 lbs pressure by which I got a pretty good button 7/16" long.

Made 5 more ~~of~~ cylinders of above by using 5.5 grams of Calcium Oxalate & 6 drops of water with 2500 lbs pressure by which I got a 7/16" button which chipped very easily.

The calcium Oxalate was made by L. Ott

Shelf #7 May 8th

Colaltus Oxalate.

Pressed 8 buttons of Cobaltus Oxalate 7/16" long by using 4.5 grams Cobaltus Oxalate with 800 lbs pressure without water.

8 more 7/16" long - 5.7 grams 1600 lbs pressure without water.

9 more 7/16" long using 5.8 grams with 2500 pressure without water.

Cobaltus Oxalate made by Lott.

Shelf 8# May 9th.

Manganese Oxalate.

Made 7 button of manganese Oxalate by using 4.8 grams with 4 drops of water at 800 lbs pressure 7/16"

2 buttons of Manganese oxalate by using 5.4 grams with 5 drops of water at 1600 lbs pressure 7/16"

2 buttons of manganese oxalate using 5.8 Grams with 6 drops of water at 2500 lbs pressure 7/16"

These were very hard to make as the chipped very easly and especially the (5.8 - 2500) buttons they chipped in their own accords.

Manganese Oxalate was made by Louis Ott.

Shelf 8# May 10th

Stannous Oxalate.

Made 2 buttons Stannous Oxalate by taking 8 grams of Salt without water and pressing up to 800 lbs pressure getting a 7/16" button

2 buttons taking 9 grams stannous oxalate without water and pressing up to 1600 lbs pressure getting 7/16" button.

2 buttons taking 10 grams stannous oxalate without water & pressing up to 2500 lbs pressure getting 7/16" button.

Stannous Oxalate was made by Louis Ott.

Shelf #8 May 13th

Copper Oxalate (Cuprus).

Made 2 buttons by using 5.8 grams Copper Oxalate with 1cc water at 800 lbs pressure getting a 7/16" button.

Made 2 more by using 6.6 grams Copper Oxalate with 1+cc water at 1600 lbs pressure getting a 7/16" button.

Made 2 more by using 6.8 grams Copper Oxalate with 1+cc water at 2500 lbs pressure getting a 7/16" button.

Had a pretty hard time making these to get them approx right as they broke - split or chipped very easily and had to proportion moisture until it held together

Copper Oxalate made by LOU.

Shelf #9 May 15th

Strontium Oxalate

Made 6 Buttons of strontium Oxalate by take 5.8 grams with out water at 800 lbs get a 7/16 in. button

Made 6 more of strontium Oxalate by using 5.8 grams without water at 1600 lbs pressure getting 7/16" button

Made 6 more of strontium Oxalate by using 6.2 grams with out water at 2500 lbs getting a 7/16th button

Strontium oxalate made by Louis Ott.

Shelf #10 May 19 1919.

Chalk Cylinders

As by request of Mr Edison I made as follows. 6 sets of 4 each of Chalk with 1500 lbs pressure, but each set having more water so that the last set is to wet to mold.

Used 5.8 grams of chalk with 1500 lbs pressure in ea but the water as a binder varies in ea set as follows

4 cylinders	5.8 grams	1500 lbs pressure	5 drops
4 "	5.8 "	" " "	10 "
4 "	5.8 "	" " "	15 "
4 "	5.8 "	" " "	20 "
4 "	5.8 "	" " "	25 "
5 "	5.8 "	" " "	30 "

After I came to 30 drops I showed product to Mr Edison and he said that was enough water ~~for~~ that. chalk came from Hoffman Dec Blank.

Shelf 11 May 28 1919.

Alumina Hydrate.

(a) As per request of Mr Edison I made 2 ea of Alumina Hydrate using 4.2 grams of Alumina Hydrate at 1500 lbs pressure but adding more water to ea set so that last set is too wet to mould.

Used in ea 4.2 grams with 1500 lbs pressure but water in ea set varies as follows.

				Water
2 cylinders	4.2 grams	1500 lbs pressure		8 drops
2 "	4.2 "	1500 "	"	12 " "
2 "	4.2 "	1500 "	"	16 " "
2 "	4.2 "	1500 "	"	20 " "
2 "	4.2 "	1500 "	"	25 " "
2 "	4.2 "	1500 "	"	30 " "

after I used 30 drops I showed product to Mr Edison he said that it was wet enough.

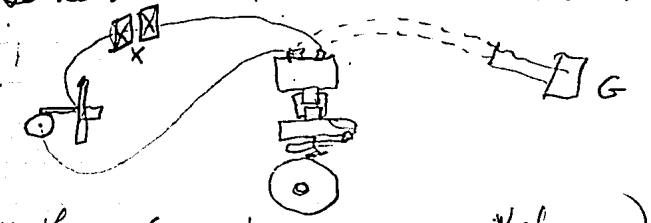
Alumina Hydrate came from Denvedda

May 13 1920

Just returned to Expmtg with Chalk phone –

Using Light Calcined Magnesia
750 lbs on our present gauge
Small single hydraulic press
15" ram in Lab – (Chem)

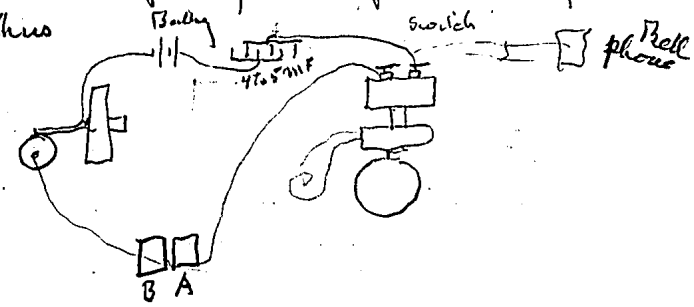
Used high res head phone. Amberal
Band record. 1100 ohm



X the 2 boxes for measuring Vol used by WE Elec made by Thompson Lebroung & Co

Edison Couldnt hear Bell phone G or the Chalk phone –

then thinking the current from the Chalk itself might interfere arranged it thus



With this arrangement I hear it loud but do not get it when A arm is advanced 1 point.

I cannot hear anything on Bell phone —

If I reverse Battery I get nothing so an impressed Voltage without Current is GREAT IMPROVEMENT in sensitiveness One of largest advances made recently

I note that beyond a certain number of Cells of Battery it does not improve Volume

I used 7 cells E D Battery ~150 V 10 V Reversible
hence we must have 25 Leclanche
with Controller to cut in + out
one cell at a time –

I wet a Magnesia Chalk + kept
it working 1/2 a day by covering
it with wet cloth while not
using – also left it all night
15 hours Cloth was damp in
morning but still could hear
music slightly – probably
Carbonation hurt it –
This shows that in closed
space with damp cloth etc +
no CO_2 it will last at least
24 hours without any loss
of Volume –

I now put in a newly made light
Calcined Magnesia at 750 on Gauge
This was moulded Dry – no water
used. It's an improvement over
those made damp – porosity more
takes 21% KOH better + quick soon
dries then track is good without

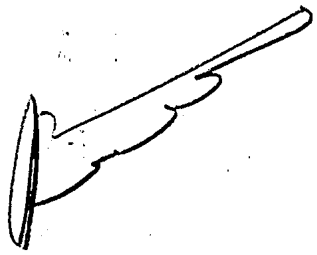
Tearing = This is another great improvement as we can now make the Mg Cylinders which has constant physical properties —

Another is that the Loudness is much improved as I now hear it on No 2 of 60x Zero or 60x out being No 1 —
Using 8 Cells + 3 Condensers —

Tried 9 10 + 11 Cells but dont notice any improvement.

I notice its considerably louder when Mg Cylinder is reversed as to turning — This shows there is still chance for improvement in the Diaphram + pressure devices or Palladium —

All night found it weak, not clear in morning New No Wet Mg — also found it translucent LOEF it agrees with only little KOH. we could not account but in hour it was



as good as last night
as I was abandoning the
Mg I press a finger on
surface for 2 Rec - lost all
sound - Observing
[illegible] bad -

New 750 Mg O - Black pole of bat
to N of chalk phone Mg OK

I found that I call doubles sound
+ after that not much increase
up to 24 - 8 seems best + about
20 @ 25% increase volume over
-1 or 24 Calls - fine adjustment
to vary fraction of a volt
I found no place where it
balanced abandoned it
(12) fine adjustment altho it
may be OK finally to use it

I notice 2nd dry MgO when it wet it softened up must rig up to left pressure until dry then let it down - if all pressure off it dont touch as OK

Our Bell Sending phone is 1100 ohm

Cant say what receiving phone is but put one in marked 1500 ohms & it wasnt as loud —

Our MgO Cylinder & perhaps all our cylinder have more Resistance than I suppose

A Voltmeter giving 1.4 V when chalk put in was almost Zero, still on turning, latter gives shade more deflection

left MgO all night wet cloth (very wet)
1/2 strength in morning - wet with
water + let it dry without pressure
on - got 3/4 of full strength
again with more water
of an excess took several minutes
to dry = came full strength.

Phenomenon

MgO 500 lbs pressure
instead of 750 lbs of the other
3 MgO used —
This 750 lb without Box gives say
100% load - barely hear to #2
with MgO 500 lbs pressure get
without Box 80% + hear to
#8 - 5 5 !

The only Explanation of this is that the Resistance of 500 Ω across MgΔ is much less than 750 + I can go to #8 but this dont Explain why it is less loud on Zero box

But I call in — the Voltmeter I tested the others gave about same deflection 1/4 of 1 deg Turning on not makes little difference Condensers out — Dont seems to have less Res perhaps 10 % less — So sensitiveness must have been actually increased by more open pores when box Res was increased

After standing MgΔ 500 got considerably louder on Zero but I couldnt hear response #8 —

Fred Oth. ~~tried it~~ got 24 on Box
+ only 12 on Bell –
This is MgO 500 lb

MgO 100 – not so loud as 500
on Zero, about same as MgO 750
Can hear to #2 on Box –
showing great superiority
of 500 lb where I go to #8

Dep MgO 500 – at Dupso OK

New Idea – Think less pressure
makes a MgO softer + when
Palladium presses hard it
compresses it when must
lower at track

↓ This makes whole touch
↓ covers Fes whereas hard
Cylinder only points touch

hence hard cylinders NG
only cylinders good that
forms a depression band for
Palladium & gets it all in
contact & polishes —
500 lbs does this — a
400 wouldn't impress it
probably

Tried 2nd 400 lb on depression
of track theory —
OK — wet it & moment all
moisture disappeared put
pressure on platinum gradually
& within 2 mins or less
increased pressure beyond
what we need till get polished
full sized depression then —
diminished press to Reg
amount approx & it
was OK Hard to 8
on boy —

Think 500 to 400 best
favoring 400 lbs

Well test 300 + 200 morning

Tried 300 lb MgO – It makes a depression track more easy than 400 – takes very much more RAM than 500 lbs, but no matter how I work it it not near as loud as 500 lbs –
+ 200 lb MgO is ~~coarse~~ earthed
ou ro 2 of 6 ox 200 lb or 300 lbs

500 lbs makes a good depression track + as it is the loudest
near to 8 on 6 ox + 200 V lbs
I will adopt that as a standard –

750 lbs does not make any depression track is pretty + distorts the Volume of the Tuning it is not so good + is not quite as loud as 500

Standard MgO
May 17 1920

MgO - Light Calcined Moulded under 500 lbs on gr. wafer on 10" Ram - is not standard

Egerton says 6 Notches on box Cuts current To 1/2 —
That each notch is 1 mile —
Shows mile is 45 ohms with a Condenser across hearing .054 Microfarads $\frac{1}{20}$ IK MF

Several Experiments shows 500 lbs pressure on MgO is best Takes 3 Red Rubber full of zi/KEA with good big pressure just after working & dried all absorbed gives a slight sunken Track which is nicely polished & reflects light like glass & is very good & satisfactory Hear to #8 on Box the calculated Limit — Cant hear Bell Phone at Zero Box —

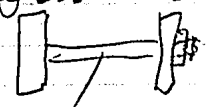
Phenomenon

Removing the 5 Cells from Cement makes Mg scarcely audible on Zero box

While battery is in cement Reversing the poles makes big difference -

Palladium pen louder than platina pen thick twice as loud -

It may be the Voltage between Palladium & platina has something to do with it I am now putting then Washers of different Metals on ends of the mandrel against which the Mgo Rests - I must insulate this



so only the special metal I want touches the Mgo

Platinum Point

Silver #2 on box – (5 cells)
Mandrill not yet insulated –

Nickel #2 on box

Zinc #1 on box & very weak

Lead # get #8 taint #6 is about sure limit – secondarily is its weak on Zero –
Any way this shows that Platinum could be used on point instead of Palladium but weaker –

Tin # get 8 on box sure –
Cant get # 10 = quite weak on Zero – not so much as lead –

Aluminum – can go to # 4
Weak start – when battery cut out nothing but wait several seconds comes up, battery cut in nothing – several seconds cant & on OK again –

Platinum —

Copper - # 8 good extraordinarily 10 = This is best yet Cut I think I got it by wetting MgO much more than any of the other metals - in addition I found ~~in all~~ the Rubber had stuck to pan - This might have done something with it — Zero is weak also will big wetting after iodide gets weak —

Run the Copper down it may have right Eff + ev to content + absorbs Q may be just what's needed —

Reg MgO, with Copper washers insulated with Rubber tube from Mandrel so Chalk only touches Copper — Palladium pan

Remark of Possibly a point

By putting Palladium back & using Copper Washers - I get #12 on box sure & think I hear 14 -
Its loud on Zero & clear - & doesnt suddenly drop so much on going to No 2 on box =
Reversing poles on Elec. itself very little change -

Apparently it needs both poles to be non polarizible - Oxidizes on Mandrel & it absorbs on pen

500K Mgo
Oxidized part of Copper Oxidized - where touch chalk but small area touching chalk cleaned of Oxide - Using Platinum point get #10 on box & think I hear to #12 -

Oxidized Copper washers - same one that were used in above new 500K Mgo & Platinum pen tried but only 80 - I notice track one sided, put in New Mgo - I notice blackening of the Cu against the platinum of mandrel

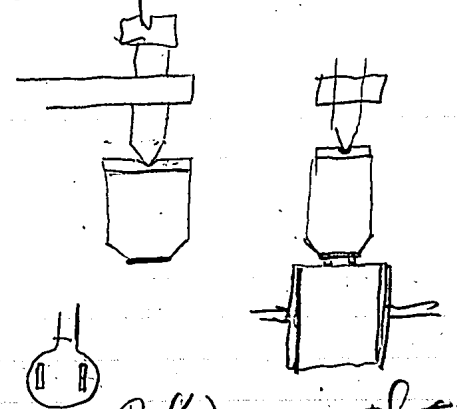
#6

Possibly it need. Metallic Copper washers to absorb Oxygen - possibly amalgamated

#7

This should not be - something wrong

Will make a change



Palladium ~~[illegible]~~
Metallic Copper on side Mag.

This goes to $8 on Gas. dont seem to be nearly as long perhaps MgO varies - 1st lot Sample made were more densely - 500 lbs 005 Mica
1/8 aluminum dome - Plumbed

I reversed the poles at Emq it
Came loud – then went low
put them back reg way
Came louder got #10 on
box –

This pen will work up to #8
with very slight pressure on pen
This pressure adjusting Change
is an improvement

Think Mgo should be 1/8 longer
at Palladium points only 1/16
from Edge

There is a lot to the battery 5 Cells
it acts strange – should
investigate at it at times
More than doubles loudness

After working & forming track
the loudness improves by
standing 1/2 hour – at least
it appears to.

Phenomenon

By putting in 7 ESBat Co Cells in Circuit

By putting in a condenser in circuit with MgO - weakens it very much -

By shunting MgO with Polarized Relay of Quad it strengthens it Enormously

I get # 20 on 60 X

WhEW -

Condenser 5 Mf in line

May 28/1920

Have tried all kinds of Magnets + Bunnel Coils Core in & Core out.
Best is old polarized relay 1st used
Next is secondary of a Bunnel Coil
Core varied only secondary used
Secondary Marks 1359 – 9350 T.

Never went higher than 18 on box
1st Expert got 20.
But several times on best magnets
only got 12 on box — once got
12 without any Magnet
This shows high sensitiveness
still due to accidental
Conditions of the MgO + wetting
Etc, But the very high sensitiveness
is due to Magnet Oriented
across the MgO —

[ITEMS(S) FOUND IN BOOK]

8 with 500 lbs
8 with 1000 lbs
8 with 1500 lbs

Mark each on end &
Put them in order in
holder —

Alumina
Hydrate
Apr-24-1919

[ITEMS(S) FOUND IN BOOK]

Ligia Cadena
Magnacia —

[ITEMS(S) FOUND IN BOOK]

Make 24 Chalk
6 Sets, of 4 Each with
1500 lbs - but each set having
more water so that last
set is too wet to mould

Do the same with
Aluminum Hydroxide
24 —

Completed
5/25/19
RD

[ITEMS(S) FOUND IN BOOK]

Cabinet Mapuera

4 at 300 Lbs
4 " 600 "
4 at 800 "
4 at 1200 "
4 at 1600 "
4 at 2500 "

[ITEMS(S) FOUND IN BOOK]

Imperial Color wks.
Glenn Falls
N.Y.

Imperial Color Wks.
47 SE 34th St.
N.Y. City.
Greeley 268.

Notebook Series -- Notebooks by Edison
Notebook, N-19-05-28

This notebook was used by Edison during the period May-June 1919. The entries pertain to electroplating, electrolytic cleaning, and dip cleaning experiments performed as part of his efforts to improve the commercial manufacturing processes involved in making disc records—efforts that included attempts to reuse master matrices for making more generations of molds from one recording. Some of these experiments involved depositing films onto copper record molds; others involved stripping those films and cleaning the molds. Among the deposits tried and found promising were compounds of selenium, arsenic, antimony, and sulphur. Additional experiments relate to the copper and nickel plating of the molds. One entry indicates that Edison arrived at and named a standard "8/4" selenium solution for cleaning record molds, consisting of 400cc of a 5 percent selenious acid in 8 gallons of distilled water. Edison noted that the "only item interesting to science in these expts" was the fact that "electro deposited selenium is a fairly good conductor." Another notation indicates that Edison "Wkd all Day Decoration day." The electroplating experiments are continued in N-19-06-18. The front cover is labeled "General Experiments No 1 Started May 28 1919." The pages are unnumbered. Approximately 110 pages have been used.

Disc May 28 1919

Experiments coating copper record moulds with a very thin film to form a new matrix which can be stripped therefrom easily, permitting many other matrixes to be deposited on a stripped therefrom without injury to the Master matrix,

Also to clean the master matrix Electrically

If the Master matrix is made the Cathode in NaOH, 20% Sol. and a very strong current used, the oxide if any on matrix is reduced to metal dirt particles are forcably removed by the great outburst of hydrogen gas, and the grease is thrown off if inorganic + thrown off + decomposed if organic, This cleans the surface nearly perfectly even with an old discard working mould and the special film is plated on the surface evenly. sometimes the

old mould is very dirty and after this treatment shows spots where the film goes on too slowly. in this case — if after gassing as cathode in NaOH 20% it is washed well + made anode in regular Copper plating solution using a moderate current density for a few seconds, it makes the surface absolutely clean + when washed + put into the film plating solution the surface is evenly deposited upon

I will determine the strengths of Electrolytes and Current density for our 10 inch matrix, all thru the process

So far results show that apparently that Sodium Selenite Electrolyte deposits a tenacious film upon Copper when it is cathode in solution of the Sodium Selenite,

Apparently the selenium is deposited & part combines to form Copper Selenide & part as selenium.

If the film of selenium is made cathode in 20% NaOH, it dissolves off slowly whereas under same conditions Arsenic film comes off quickly & entirely, apparently showing no combination of the Arsenic with the Copper

Selenium film after washing & drying cannot be removed by rubbing, even with Tissue paper, no matter how hard or long it is rubbed.

Also the Selenium film receives an very fine glass polishing polish without apparent injury

In the case of Arsenic film after removing Electrode from the depositing solution the tissue paper is slightly darkened by some black

flocculent arsenic coming off -

This is not true of Selenium - however the arsenic film receives a good polish but not so bright as Selenium,

After polishing Arsenic + Selenium films the Copper is deposited on both easily + evenly -

The Copper strips very much more easily from Selenium than from Arsenic

The face of the Copper stripped from Selenium if latter is well polished is bright + clean + shows no smut of Selenium whereas if deposited on Arsenic the Copper shows a tint due to some arsenic coming off -

However it is probable that if

the arsenic is buffed & highly polished none will come off.

Probably Selenium being softer than Arsenic gets a smoother surface & more polish than arsenic hence Copper does not carry any when removed,

This would necessitate that to prevent Copper removing any of film matter that the film or matrix whatever its nature should be highly polished preferably by a fuzzy buff that will polish bottom of grooves as well as tops of sound waves.

In using Arsenic a rough expmt with Copper strip 1" wide & 2½" long in Electrolyte that 20 milamp for 10 to 15 minutes deposits good Arsenic film, even ok if Copper is well cleaned by Cathoding powerful Current & subsequent slight action to anode,

with 3% solution or 15% solution of Arsenite of Soda the arsenic film with 120 milamp 10 @ 15 mm is equally as good showing great range, I should say 15% sol is OK — as Ar is removed it will last longer

In making Arsenite Soda solution there is a flocculent substance in solution of Selenium. This does not filter out but using bone black the solution filters perfectly clear

The Selenium solution filters clear without bone black - solution keeps clear when exposed to air

This appears true of Arsenite of Na -

Both sols are alkaline & probably absorb CO_2 must determine this,

I also tried Antimonite of ~~Potash~~ NaOH (see which) This forms a metallic Zinc like film & acts well, Copper strips from it –

Must experiment further with this –

Also tried Tellurite of soda. This only deposits cloth on Copper. = Solution darkens in the air perhaps solution not properly made,

Sulphite Na Hyposulfite Na Sulphide Na dont work on Cathode but does at anode this is true also with Iodide K Bromide K & Chl K
Anodic deposits poor & not promising, comes off when made Cathode in plating Copper

The 3 promising are

1st Selenium
2 Arsenic
3 Antimony

Note,

The only item interesting to science in these Experiments so far is that Electrodeposited Selenium is a fairly good Conductor, it is not probably deposited directly as a metal but is result of a secondary action of Sodium reduction -

It will be valuable for "light" changes of selenium Expts.

I note that voltage ~~with~~ is high with 4% Arsenite, 2 Volts gives with $2\frac{1}{2}$ face 1 side 14 Milamp.

Further Experts Arsenite Na 4%
on 40 minutes, started 14 milamp 2
SB Cells, at End 40 minutes it was 18
Milamp — The deposit is rather
bright and shiny - seems ok - but
under microscope

Note very fine balls or crystals showing
deposit entirely to thick —

Probably 10 @ 12 minutes is all
that is necessary but its
interesting to know that smooth fine
deposit can be got relatively thick

Saved it Marked #1

I have just stripped the Copper
plating from an Electrode covered
with Arsenite of slight thickness +
polished + find that the Copper
only removes a faint amount of
Arsenic, Copper is regular Copper color
but from looks of Arsenic covered
Cathode it would have to go into

The Arsenic film set for a slight additional coat to 62 sure —

It is likely that anoding the record is bad as it produces a matte surface & tends to matte the arsenic film & this in its turn mattes the deposited Copper interfering & pulling off some arsenic —

Must find a way to clean surfaces without anoding — The Soda Solution is probably OK for new Masters but not enough for old working moulds as we will only use new moulds its likely the Soda cleaning will answer

~~Either~~

This strip from which I stripped Copper from & which showed a Coppery shade in place but back in bath 20 milamp 3 minutes Copper disappeared

But I noticed finger marks which this plating brought out Conspicuously

NoTe →

In handling filmed moulds & stripping matrix therefrom they will be spoiled if finger marks get on

Filmed Moulds cannot be Cleaned in Soda as the film is quickly removed by current, both with Arsenic & Selenium,

Its difficult to reason out a process whereby the can be cleaned

Took fresh old wax mould record strip, cleaned it Electrolytically in Soda & put it in 4% Na Arsenite - Mil amp 14 current

(91)

immediately down to 11 Milamps x
in 2 minutes went up to 16
Milamp — + is partly coated x
4 minutes 18 Milamp — I note
green streaks on it — probably
I didnt clean it well — x
2 minutes streaks gone — good
Coating on + Even + Ok for
Regroark —

I will now leave it in bath
plating at 18 Milamp +
go to supper - 7 pm — x
returning at 8 15 pm current has
increased to 21 Milamp x — Deposit
at 930 Ma gone down to 11 — Removed it x

look good & bright to naked eye

Notice that arsenic film thin, rubs off easily with pencil eraser & thumb. The arsenic does not combine with the copper to form an arsenide, simply plated on

Selenium - Note copper when pulled off does not take any of the selenium film that copper is bright. The selenium was rubbed with toilet paper to brighten it before plating —

Eraser of pencil removes film with more difficulty than arsenic -

Note

Selenium strips very much easier than arsenic —

Even the plating on the back stripped easily & OK where selenium was exceedingly thin,

Think films should be very thin either with arsenic or selenium, just so face is unmistakably covered, & after designing buffed very slightly to polish —

Just rigged up Copper plating bath so can plate several strips at once. Carbon Res + ammeter

I find 3 X 1½ strip that takes immersed to 3" amperes burns + makes red deposit,

The strip I had in Arsenite Soda 4% for 2½ hours is OK - had very good matte surface, not perfect in grooves but Music Wires not ok

I rubbed it rather violently with bunch of paper, - I noticed one small area of Copper appeared in the 2½ inches under micro. This shows film chipped off - film is brittle - deposit appears to be .0005 thick I put it in big Copper bath ½ amp to start with -

Everything goes to show should have their films, dried + buffed by a very fine cotton or hair brushed to polish -

Note

Arsenite Na – Depositing film on Nickel instead of Copper

on 9.40 12 MA – took out

10.05 25 min – Nickel looks darker, covered OK but Arsenic is dull + resembles Ni so the film is not so striking contrast as with Copper –
Put in bath

Phenomenon – The above Nickel had been used as an anode in the Arsenite Solution –

I took another Nickel + Cleaned it in Soda Cathode –

On putting this in 4% arsenite bath it coated much darker in 2 minutes than the anode Ni did in

note

25 Minutes —

It seems that while Nickel as an anode in Arsenite Soda. Selenite Soda Elc in alkaline Sols & appears unchanged & bright there is some very adhesive film on it which prevents goods deposits by plating being formed on it whereas if subjected to powerful Cathodic acid & Soda 20% This film is removed & deposit goes on at once & even

Selenite Na Solution % unknown is very much better conductor when 4% Arsenite gives 11 mil amp — Selenite throws Meter off scale —

Selenium I find with 20 Milamp unlike Arsenic is entirely too high surface density of current it actually deposits & flakes up & throws off -

About 10 ma for strip 1" wide - 2 3/4 long - facing the anode & of course the back which gets some then it deposits in 3 minutes a bluish even film - This is about 3 Milamp per inch 2 is safe.

or 80 Milamp for Reg desc

1/2 immersed,
in 2 min more instead of
bluish is deep pink,
2 minutes more pure blue
+ very even -

Phenomenon —
Arsenic covered plated
bug bath 1/2 amp density
on stripping <u>all</u> the
arsenic came off on
plated strip.

It was probably the
thick 2½ hour deposit
that came off ~
later No not so,

Queery
If density of Copper plating
Current is high will not the
Copper be driven into arsenic
~~where~~ + Cause arsenic to
Cling to plated strip
Whereas if first coat of
Copper is put on a low
density, + after Coating)
The density is increased
will it then not pull off
the arsenic
Test,

Note, Cathodes made from
Comel Copper sheet full
checks + surfaces are not
cleaned by Cathoding in

[41]

Soda except for greasy,
Spots do not cover
Electrolytic Copper and
discs strips act entirely
different,
On Comal Copper.
Can only use 5 mil amp
to deposit Selenium
which goes on fairly Even.
This shows safety lies
in very low current density
in deposited any kind
of film - 1 milamp per

inch is probably OK —
or 40 Milamp for 1/2 immersed
disc —
Even if 3 Milamp can be
used on Electrolytic a only
1 on Cond its safer to use
One Mil amp on Electrolytic

May 29 1919

I find by dissolving a little sulphur in hot 20% NaOH, & diluting to a very light yellow tint. The Cathode strip dipped in it in a strong current that Copper Sulfide is formed of any required thickness from a faint shade to deep blue & that a light shade put in Big bath & plated on strips from Both plated & original are dark, very [illegible] the film.

still left on dipped Copper is perfect. The pulled off strip film is also perfect.

Think several strippings can be made before necessary to dip in solution again.

This is the most practical of all as its not a film which may pull off but an actual combination of sulphur from the water partly transferred to plating it makes perfect stripping

I note that if the film is subjected in 20% NaOH to powerful glare for 10 min it does not decompose the sulphurized Copper it lightens the shade only but is stick perfect

Note —

I tried dipping in Bromine water but the film of Subbromide is not sufficiently Colored to tell, it shows a duller shade —

Iodine in alcohol poured into water & Copper dipped shows better than Bromine but not enough for practical work I think —

Sulphur appears to be the most practical film ——

Selenium dissolved hot in NaOH 20% when poured into water decomposes to a flocculent substance apparently copper in time a very light film deposited 2/2/1011,

So far Sulphur best, Especially as of all metals Copper has the greatest affinity for it, CuS is a conductor. also anhydrous + will not oxidize in air –

Note,

When a cathode strip is Cleaned by big Current in 20% NaOH washed & put in light yellow NaSulphur Solution it Coats slowly but when Cathode is stirred it Coats very rapidly –

It will probably be necessary to rotate disc in Very weak solution – otherwise owing to Extraction of S at Contact it can only get S by circulation & this may make deposit uneven

Rotation need not be used if yet of the solution agitated solution

I stirred the cathode for several minutes when it reached a deep blue. Continuing further reached a deep lead color & then it appeared as if it would go not further,

It covers in bath rather quickly but seems to be slower than with lighter films —

None of Sulphur films are attacked by regular plating solution with H_2SO_4 in —

This is fine —

A fresh cathode coated Sulphur put in NaOH 20% & big Current, it became darker & could then be wiped all off with towel

So these films cant be cleaned at first but after plating & stripping dont seem to be affected by cleaning in NaOH Current.

Just found that fresh filmed Copper put in NaOH 20% without any Current can be wiped off so the Soda has an action

I now find that S films after plating it put in NaOH + Current wipe off

So Alkali decomposes the Sulfide Copper + loosen it —

A film of nickel .002 thick deposited in 17 hours from an arsenited surface on old discard Copper matrix, using bag filters + 3 jets at low angle 72g plating sol NH4 Ni Sulfate was brightest of most we ever made in this lab. The record on plated side showed in Mecro that it was more shiny + cleaner than the original. We use Ni anode containing 8% Iron + the filtering was perfect keeping away the flocculent ferric hydroxide from being plated into the nickel, also the 3 jets helped

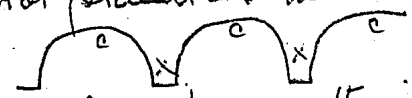
This Ni is brittle breaks bending once on itself — 4 times

in fact breaks before. — 3 times

But if hard on hot plate 250 Fahr for 1/2 hour it can be bent slightly more

(cont)

another thing I noticed that it was not plated as much



at X as at C hence thinner at X - hence tors along grooves when pulled off mixbix -

Also noticed that arsenic film had spots where film pulled off copper. This is very bad feature of plated films which do not combine with the copper. Sulphur being an actual combination is free of this defect,

Selenious acid

10 Ma deposits in 10 sec a black film —

Later = Deposits without current like NaS -

Arsenious acid is slightly acid —

The deposit is extraordinarily Even —

When Copper is dipped + Coated blue, washed + dried, it cannot be rubbed off by toilet paper So its as good a Sulphur in this respect, its appears to Cover more Even being an acid solution

(65)

The selenious acid dip film is not affected by your acid copper plating solution —

Also it receives the copper plating right away & OK in all other respects —

If rubbed immediately after dipping most or 1/2 comes off with toilet paper but none after drying —

Note If copper is not cleaned by current in NaOH film not even but if cleaned 10 seconds film perfectly even

Sulphur, with very light film shows no film after plating on silver, pulls off very hard — Too Hard for practice —

Dipped 5 min in weak NaS — light film shows dark on both. Comes off Easy & OK

Blue film — strips fairly Easy blue on both, most on Cathode OK —

A Deep blue Neg-film pulls off Copper

Remember these Cachets are Commercial Sheet Copper full Check & flaws —
Results be very much better on Plated Sheet Copper —

Evidently film should not be too thick or too thin, full lead is about right I think

I now put 4 Selenious acid dips, Light + heavy films in big bath for all night, Now 4 pm — Wife wants me to go in town —

They all cover quick
1 amp for the 4 — Each 3" front + 3" back —
Will leave at 1 amp for all

1st Strip

Copper cathode strips dipped in Selenious acid. no current, –

Color Very light red.

Strips perfecting no disturbance of Selenium on Copper

Copper stripped off bright without any apparent selenium on it

Commercial strip copper used it was cleaned by NaOH + Strong Current,

These 4 strips now described were dipped in Selenious acid, Washed well at faucet, then rinsed in distilled water + then hung up 3 ft above hot plate to dry for 1/2 hour.

2nd Strip was Lead colored (1e)
very thick Selenium - This had
only very thin plating none on
back + not all over on front
Copper stripped off bright +
free from Selenium,
Cathode selenium film intact
+ perfect,
Should say Selenium was so
thick + so poor a Conductor
that it didn't plate much
probably wants high Voltage
Test this!

3rd strip

Strip with deep blue stripped perfectly, heavy deposit twice as thick as strip with red color

No selenium came off of stripped copper, blue film intact -

The back is even more perfect in fact it is perfect. The copper stripped off is very shiny - with no trace of selenium. This had a very much lower current density - 1/4 amp was used -

We must use probably 10 to 20 milamp at first to get perfect covering & then increase amperes to desired amount

4th strip Lighter blue

On front where current density greatest, Copper stripped off far but bad spots.

On back where current density small, Copper stripped off is brilliant + film is unbroken.

Selenium is the easiest stripped in fact it is far superior to any others, there is not clinging at all when current density at start is low,

I shall adopt
Selenious acid dip
Washed by a forced stream rinsed with distilled water & dried — cover over with 3 mil amp per inch of face ignoring

the back in calculating —

I notice that strips from old working mould cleaned by Current & 20% NaOH, washed & put in Selenous acid gives a perfect blue selenium film absolutely EVEN

Blue film. Selenous acid dep — Copper Plating

2 cells —	10 ma.	7 mm	no deposit	
	20 "	25 "	"	
	40 "	16 "	just slight Cu	
	42 "	18 "	nearly all over	

Transferred to small bath after 1 hour stripped fine very thin sheet very bright film intact, Cond Cu — OK

3 Cells

Cathode from old coke mould
Blued in Salamons acid cooked
dried over hot plate

10 Mil amp	10 min	faint chro in one spot
40 –	12 "	shows a little more
80	22 "	scant covering
80 Ma 3 Cells	12	a little more
80 Ma 2 Cells	1 hour to deposit	

found it all covered over good

later — Red colored film –
200 Ma covers in 8 minutes all
over – after 3 hours stripped ok film uniform

Blue color

200 ma covers all over a OK
15 minutes – 3 hours stripped
OK – film uniform

I now make one goes considerable
beyond blue to lead + beyond that
to metallic looking –

One that went beyond blue
till metallic looking
Covered all over in 10 minutes
put in big bath 3 hours
stripped perfect + without
pull = just like lifting it
off. Noticed plastic tape
was fine & bright but had a
pink tint just barely perceptible

This is ideal if OK — go just
beyond the blue till blue
disappears,

But the Margin is very
great from ~~B~~ light red
to beyond the blue or in
a certain strength of selenious
acid (very weak) for 1 min up
to 5 @ 8 minutes Watching
it in solution during
immersion

Can strip off the Thermint
film .0002,

If you go further than just beyond blue stage,
It gets Brown + a flocculant lot of Brown is on surface + can't be washed off by powerful stream from faucet but can be wiped off - but in doing so a little of Copper is shown

This shows that overdoing it expands the selenide of Cu so much it cracks + then there is further penetration + finally all will come off in powder.

It seems the film will be firm up + just past the blue

Probably blue stage may be safest,

Wkd all day Decoration day — 2

film at 1500 Ma thick -

1/2 thick would be ok to strip

3 hours at 300 Ma will be ok for tests.

4th stripping ok but notice a hole where there was a round spot copper bright on Matrix, also 2 or 3 very small holes which were probably in Matrix — There are several other flaws. Think shall have to Either dip a little after Each plating or inspect + put a fine dot of Selenium on flaws — Probably some of flaws are due to dirt clinging in plating solution,

Saturday -

Last night put in a blue selenious acid Cathode of old working mould Record. Covered ok in 12 minutes with 200 Ma — left it all night from 6 20 pm till 10 30 am next day with 100 Ma on —

Stripped perfect, used asphalt paint around edges, no cohesion of plated Cu to film, latter intact + is now in for another plating, starting 250 Ma —

Nothing could be more satisfactory so far.

2nd Stripping 200 Ma amp 20 min Then 300 ma amp from 11 10 am till 310 pm Total 4 hours 20 min — Stripped perfect as 1st one no injury to film seems perfect, Into 3rd at 315 pm at 200 Ma amp for 20 min then at 300 for 4 hours off at — See left page

CAJ

What happened to

The Copper cathode I left in Selenious acid last night I found films split off & blue hydroxide precipitous all over, & bad mess, solution green —

This shows that the films reach a certain thickness Expand & Crack solution goes in attacks fresh Copper & so on

This shows film must not go beyond first blue allowance it may Expand Crack & make flaws —

Note

This supposed crystalized Cu hydrox - not attacked in 20% NaOH. Cold

in watch glass in 2 bulles decides gets darker in 20 minutes after pulling on

Stands 127 Fahr. Bluish

The copper left in Selenious acid 15 hours which gave off films & considerable granular blue pieces, I find that these blue pieces are beautiful Crystals glassy transparent, & form the principal bulk of the action

What are they ? ?

Crystalized Hydrox of Cu or Selenate Selenite of Cu or What ? ?

probably Cuprous selenite, most H_2O

I also find solution green & perfectly Exhausted as a fresh Copper is not acted on

Arsenious acid dissolved in boiling water & hot does not form a film except very faint even if waved a long time in the hot solution, or when sol is acidulated with H_2SO_4 — slight tint given only

In plating on blue selenious acid film with Cu I notice that it leaves the sound wave part very much easier than smooth part —

Tartar Emetic deposits some metallic (Sb) with Current but it dont measure it to a very poor deposit, It doesnt deposit by simple immersion —

Put in as selenium Page 12

The Question is now Shall we use Selenious acid dip to blue, & trust to get off 10 to 15 Matrix without chance to repair mandrel

in case specs flake off.

Or should we deposit a film from Sclenite Soda by Current, which tends to pull off Each time its used by when it gets bad can be cleaned of the film by making it Cathode in 20% Soda + use of powerful Current + then replating a fresh film saving the master — Work

this up. trace of practicable.
+ better than immersion.
Dipping allows reaction
by forming CuSelenide. -
Whereas plating SE dont
attack second,

Note, We must have at least 3 strong jets of solution against the Selenium face while covering to keep dust off -

Also I think that after 2 peelings we may have to make an extra Selenium dip to light red stage to cover any flaws.

Also if a flaw is seen where film is pulled off think it can be locally repaired by a minute drop on a needle like point, allowing it to act & then wash it away by distilled water,

At 10 40 am put in 2nd Cathode painted Edge Blued in Selenious acid washed distilled water previously cleaned in NaOH 20% heavy current

After washing well at faucet & then distilled water dried it over steam plate then painted at Edges with the Asphalt Varnish & dried 10 minutes

Put it in 150 Mil amp
300 Mil amp on at 1110 am -
Sunday -

Nickel

The Copper strip Selenous acid blue — put in Reg Nickel plating Solution Nickel strips but pulls off the selenium from the Copper it is all on the Nickel —

The Varnish is underneath + is probably changed by the Nickel Solution, although in Copper solution it is off —

Notwithstanding low current 150 ma plating Low amps End not good think 100 ma or less is necessary for Nickel —

I am right wants low ma got 20 ma on + covers ok now + then a bubble on Ni shakes free wants circulation —
Think film will not pull off if started + covered very small Current. The Varnish wont do for Nickel Solution

By leaving Nickel Cathode in Selenous acid 3 or 4 hours at blues. Plated Copper over it + stripped it — it stripped hard + ½ of Selenium film stand on Ni + ½ came off with the Copper

I painted a strip all over dried + when put in Copper Sol adjusted to give 300 ma it gave 100 milliamp —

The Edge is bad — where Var red it break from + deposit in pieces —

Took a Comal copper having rather smooth Edges varnished dried + re varnished + dried —

no Se on —

Note I put some selenious acid in our Nickel plating solution
No action on sol-

Yet dipping Copper in it it blued OK

Also put some selenious acid in our plating sol
no action on solution
it dont blue it but
Browns it & some rubs off
leaving a dark-red.

Start Experiments on various Varnishes for Ni plating, different solvents,
Start & plate at 20 ma.
& see if can increase to 50 @ 75
or 100 ma.

Try nitrocellulose
Cumerone resin in various solvents
Linseed oil
Rosin Varnish
Jutalong
Marine glue
Paints from G W Estln Elec
Burnt rubber

Note, When Ni is plating with asphalt bonder Varnish Even with 20 Mil a + Covered the Varnish is all full of bubbles, along Edges & generally all over. This is not true of Copper plating —

No 5 A. was dipped in selenious acid giving very slight red, then No 5 plated this dont show any of the defects on No 4 —

Showing that if we first dip to full red + then take 2 Coppers off — then a very slight red dip gives 2 more + so on think can get 10 to 15 without the several dips being heard as altogether it will not be as much as beyond blue which gave a good strip —

Low density of Covering I think is good —

50 @ 100 Mil amp for both sides when Covered thoroughly Can go to 300 —

Ni 20 then go to 75 possibly 100 must have circulation

Nickel -

The blued Copper put in Solution of Reg Ni Sol at 4 55 Sunday pm at 20 Ma I find at 9 am monday was 10 Ma. + good nickel plating Came off about same as Copper plating - Condition perfect.

1/2 apparently Came off on Nickel or perhaps more as Ni strip was darker than Copper which was reduced from blue to Light red - Apparently Ni has more affinity for Se than Cu yet this cant bring on deposing of the Ni metal ion in formed into the Se - in any Event it wearies off Even the brass came off but it was very thin + black in middle -

Made a Dep of B. Called DX-
There were some bare places
pulled off - put in Se Sep 5 sec
& started depositing again
This had a varnished back but
it was only fair, Edges all Copper
it dont work on Edges Varnish
made great where high density

Possibly if had been less density
might be OK but doubtful
200 ma all night -
Think this Varn ng -

Put one in 455 Sunday PM -
out Monday 9 AM. 200 MA

This was coated light red

Came off perfect,

Put in again without
redep'g, for another Run

note

It looks as if red film stick better + will be safer than blue as it can be redeposed more often without giving sound at defects,

note

I find that if Ni Cathode is cleaned by sand paper & then by Current in NaOH 20% that it gets black in 2 or 3 min in very weak Sc acid about 4 to 6 times lower resistance than Copper —

June 2 1919

A

So far have stripped 8 films off a blue. Se redipped once 5 seconds after 3rd. 5 after dip, the 5 are OK

On another one B only se to red full length mostly grooved of record got 4 off + all apparently perfect Cathode looks perfect,

Dark red or even light red is I think even better than blue as film is tougher + also it gives chance for 2 or 3 redips before wheat goes past blue stage

Put on this page by mistake

4th June –

To date dip in Selenious Acid to light red, deep red, red ~~+some~~ blue is OK possibly pure blue as if a spec comes off a 4 sec dip to get very light red on spot brings it OK again,

Have made 10 strippings with only one 4 sec dip + still OK good for twice or more with possibly a 4 sec dip –

With a Cathode not pointed at the Edge can with Conc Sulfate of Nickel go as high as 10 amp density rate on a 10" disc The Nickel is hard springy + Tougher than we have had –

BUT When I point the Edges it strips with 10 amp density but not at 1 amp density but may when it gets thicker (See 3 pages ahead)

June 2 1919

I made up some saturated Nickel Ammonium Sulphate Solution & found it covered OK with 200 Ma amp density standing still. Would stand 3 @ 400 Ma rotating & chunk

The solution used for Celluloid is much weaker & will not stand over 50 Ma. Mac says if he makes it stronger pulls off Celluloid –

Mac's Nickel is very hard & brittle breaks ——— breaks whereas with saturated sol my nickel strips called be bent & straightened without breaking – surface is matte & not bright like Mac's

Nickel clings far worse than Copper to the Se film & appears to be discolored

slightly red from the red film on the Copper Cathode ~~Then~~. The film on this Cu Cathod is light red & appears to be perfect after nickel removed, except one small spot I redipped till slightly blue & this spot turned red showing how the redip repairs defects or pull off of film on spot

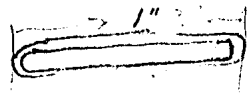
June 6 1919

Think that I shall have trouble in preventing Nickel from peeling from Selenium Without an

Anchoring at Edge

Experts show that without anchoring around the Edge the Cathode strips in Conc $NiSO_4$ + hydroxide only 100 mil amp can be used - Even this is not sure, in fact its not sure even below

But if anchored



2 inches long

A density of 200 Ma is ok 14½ hours deposited on front face 007 - stripped perfect back nearly smooth - showing allowing equivalent

Jan 6 1919

of 1 inch for back, making altogether 3" sqr - with density of 200 ma ~~sq~~ is OK & safe & good deposit, As the disc has 26 times the area, 5 amperes can be used & give 007 in 14½ hours 2·07 hours per 1/1000 thickness, if 005 is to be the thickness on disc then 10½ hours required or 2 matrix in 24 hours

I find the nickel tough

(131)

not springy, if bent it stays bent, probably the 14 hours permitted the Na hydride to slowly decompose, or that owing to strong solution + low density very little H was formed to make hydride.

The only doubtful thing now is, will it crack when put on the 10 3/8 disc —

I took the Conc Nickel sulfate Solution with $Ni(OH)_2$ in that I have been using — added 33% of H_2SO_4 — + started at 100 ma for 20 minutes $2\frac{1}{2}$ hours 200 Mil amp on taking out found covered with Ferric also the deposit so brittle it had flaked off in spots & all was excessively brittle & ng —

Evidently iron in the Solution is fatal —

This shows filter press plates must be heavily

Nickel plated & no iron must be used around solution, also pure Cast Nickel anodes used, free of iron - Solution kept Continuously neutral by use of Nickel Hydroxide fresh & not dried, but free of Sulphate Soda or iron

Tests of Varnishes on Ouell Matrix strip - Cleaned Elec in NaOH, washed, Red in Sulphuric acid - Painted 2 Coats after thinning down, (Fredette)

#1 - Varnel Varnish used by Cabinet dept Silver Lake. Bad at Edges only 120 Ma 10 min in Acid Copper plating Sol. 3 calls +

#2. 110 @ 120 Ma - Japan baking Moller & Thumain - Bad Edges opens on flat part.

#3 Newark Varnish works Cabinet baking Var. 110 @ 130 Ma. Bad only on Edges

2 Coats

#13 — 100
160 —

Edge OK — all the Current
went from 3 fine bubbles in
Varnish —

This is a good Varnish
Its our Reg Condensate
without Lampblack

#12 B+P Bad Edges 120 ma
180

#11 Eccobatto. 120 ma
180
Bad Edges, some on flat

#9 — 130
180 Very bad Edges
flat pretty good

#10 60 —
120 — Bad Edge + flat
Asphalt Varnish

#4 Velvet finish Enamel, Kno Kay Enam
Co 110@120 Ma bad on Edges on flat.

#5 Armature Var 110@120 Ma
Bad Edges + middle.

#6 — #1378 1st Coat enamel K+S Co
Bad edges considerable on flat.

#7 Murphy baking Var 100 Ma
Edges good except at bottom on few
~~[illegible]~~ areas on flat,
Probably best of all, possibly too
thin.

#8 Lacquer from Rhono Lake
130 Ma. fair on Edge but bad on
flat, Too Thin —

200 cc water, 3 cc of a solution of Selenious acid which solution Contains 5 grms Selenium in 100 cc of water, - this is.

30 mlg to 100 cc

The reds the small strip in about $1\frac{1}{2}$ to 2 min 2nd strip $1\frac{1}{2}$ min 3rd & 4th.

Made 10 dips - strips $2\frac{1}{2}$ long 1" wide altogether 5 Sqr inches each Cathode - The last dip took $1\frac{1}{2}$ min to get same Color.

This makes 50 square inches that this solution has filmed,

I dipped 15 strips last 2 required 2 minutes,

This is 75 sq inches in fact 80"

which is about surface of 1 10" $\frac{1}{8}$ working mould disc—

This degree of solution is I think OK—

Each 200 cc water having 3cc of a 5% Se solution is good for one dip—

or 5 discs to a litre

about 15 Discs to gallon

Big glass jar 8 gals

This will be OK for 100

June 9th 1919

deps, 4" from Top –

8 gals requires
450 cc of a 5% Sol of
Selenious acid —

Good for 100 Deps of
full sized Matrix —
Average time 1½ min
When moved Continually
in the liquid & 2 min
towards the end —
Developed on verge of
blue

After having covered 15 strips by waving in the sol of 3 cc of 5% sol of Silver nitrate in 200 cc water I found 4 strips in not stirred head got metallic like — I then put in 5 more strips without stirring — in 24 minutes all deep red —
Altogether 24 strips have been covered OK — or 120 sqr inches with the 3 cc

I then took 1 more & waving it it gave right shade in 8 minutes —
Might say that 25 Cathodes exhausted the solution 125 sqr inches

Standard June 10 1919

5% Selenous acid in H_2O
is to be called H/B

8 gallons distilled water,
400 cc of Selenious acid
well stirred – Requires
about 2 minutes if
properly cleaned by
Electrolysis in 20%
NaOH, to give full
Red –

For cleaning Mirror, etc –
20% NaOH.
100 amp per disc – about
20 seconds –

Can't say just yet if this is
OK

[157]

Note: June 11 1919

One of Dally discs
OK – Clay flock + 50 50
Linseed Resin Oxidized
30 mesh –

Soaked in Water 15
days – absolutely not
affected at all –

In using 20% NaOH for cleaning a Electric C.
there is always a black deposit on the Copper —
If the sal is in hand rubber sulphur comes out & this helps to increase the deposit
After Considerable Expert have found that nearly a saturated solution of Sulphate of Soda made slightly alkaline with few drops of NaOH, does not give any deposit,
Also I have found that to get real good cleaning

the article being made
Cathode must when strip
is 1" wide & 2½ long
must have 4 SBat Cells
on format lear than
5 minutes a little
longer is preferable'
There is in circuit with
the 4 Cells the small 1½
Carbon-thoretal screwed up
tight, Think shall want
75 amp on ½ immersed
disc — for 5 @ 7 min
when daily —

I have also found

that there are dirt particles still sticking to the article after cleaning & of strip is washed with strong stream these particles do not come off. if the strip is put in Selenium and "a film" & washed with fly cloth wiped the cloth has dark smut, but after cleaning if while water is running over strip a brush is used these dark dirt particle

are removed, before going to the Selenious acid bath its better to clean for a moment in Sulfate Soda bath, wash, & put in Selenious — after film is on a cloth wipe does not wipe anything off — no amount —

I am using the old Tar bound battery carbon for anode in the cleaning solution I had to abandon nickel

anode as $Ni(OH)_2$ was produced,-

But the Carbon is slightly attacked, and Calomel deposits a little

I am trying graphite anode -

This cleans the Copper so Aluminum film is even all over which up to present has not been so, there being spots when 20% NaOH alone used,

I have made a Copper Cathode, filmed red with aluminum & have already stripped 4 good Ni strips from it without redopping its still OK –

Tried Acheson graphite Anode in Na_2SO_4 slightly alkaline – 25 mins full Current no darkening its OK for Concl work

[165]

June 15 1919

It appears that with dark red Copper coated film of Selenium that 4 strippings is about the limit when Nickel is plated on + that it should be redipped to dark red again.

A 2 second dip in cleaning solution Na_2SO_4 nearly saturated + slightly alkaline cleans off grease + does not

injures the film –

I notice that if nickel is taken out of bath & washed & then put back again & more plated on that the 2nd layer is not integral but seperates from 1st layer but not Easy.

After filming with Selenium & washing. The matrix should be immediately put in plating bath & not allowed to dry & the fingers under no circumstances allowed to touch the wet face —

June 15 1919 —

If a Copper is cleaned 10 min in Na_2SO_4 (alkaline slightly) sol by heavy current, washed & while wet squeezed between fingers, on putting in Copper plating sol the finger marks is not covered at once, takes considerable time to cover.

If I clean the Cathode strip wash & then film dark red wash & put in cleaning solution for a second, the finger marks go & on plating there is no evidence of marks. If filmed Cathode

is left too long in Na_2SO_4 sol with current on to long say 5 seconds it removes some of the selenium -

Possibly for this should have very much weaker current.

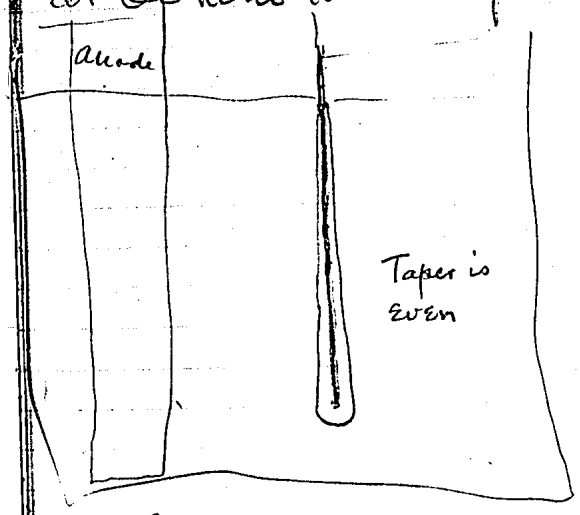
This cleaning if necessary which (I think it isn't) should be a second or sub-cleaning solution as cleaning films of done in copper cleaning Na_2SO_4 bath would liable to foul the solution with selenium

Note, Even pressing a clean cloth on film of Se while wet, This dont plate Cu over nearly as quick as where untouched shows Even cloth leaves something on but its OK as compared to a finger mark

Pressing clean cloth on a dry Se filmed cathode apparently does nothing

I used cleaned towel possibly washing soda in water & wet towel then wash it out & acid on film

Note All cathode strips plate in Copper & also nickel thicker at bottom than top



Why should it do this — What is the explanation

In any event the density must be about twice on last 1/2" as on 1st 1/2" hence by Centralization can double the density probably 2.6 amps on the 1/2 desc or 3 —

(115)

Dried all night blued Cathodes
dont cover so quickly as fresh
ones put in that. Probably
15 hours old & during the O2 changes
to poor conductor at 1st its
Conductivity & on drying
gets less & less & might ultimately
go to a non conductor at
covers 3 times slower than
fresh ones -

I note that if a dried blued
Cathode 15 hours old is
put in cleaning acid for 1
second the blue disappears
& only red remains but
this hangs on for many
seconds =

In tumbler with graphite anode & Na_2SO_4 sol. slightly alkaline, after working 10 strips 5 to 8 mins each 5" surface each that the sol has a slight yellow tint & there is about one gram of graphite come off —

I think the graphite has not been subjected to hydraulic pressure

We should have an anode 2 to 4 times larger surface than cathode to reduce deposit density also a filter between the cathode & anode I think linen will be ok as it very weakly alkaline

An old 15 hour blue filmed cathode, placed in trough with water over it & rubbed strongly with the coarse fibre brush doesn't apparently remove any of the O_2 film & it covers ok —

Rolled Nickel when cleaned well in K_2SO_4 & current

Selenium cell turns it yellow quickly - not so fast as Cu but it peels off Electro Ni - & it covers with Copper quickly

After stripping Ni 5 times from Copper Se film - the 5th stripping came very hard Then dipped it again slightly - The 6th Ni from this came off fine, easy showing - that perhaps to be perfectly safe

The Copper when Nickel is to be stripped therefrom should only have 3 nickels stripped off When it should be redipped, just ~~[illegible]~~ red, & it will probably give 3 more & so on

Note June 16 1919

Selenious Acid when put in Concentrated Sulfate of Nickel does not form a precipitate and films form on both Nickel & Copper takes over 1 hour when Ni is still in a sol quite strong of Selenious acid in Cond $NiSO_4$ to deposit a slight brown film

Therefore if nickel is plated in $NiSO_4$ sol say for 1 minute & held at 60° for 1/2 minute there will probably be a sufficient film of Selenium formed on the plated Ni to prevent the next plated layer from sticking — Therefore flake.

June 16 1919

Concl. heat Ni — film (with Se) after cleaning in Na_2SO_4 + Cyanide (alkaline)

Deposits Copper OK strips OK Color of Copper like Ni after stripping. This works OK but think Ni must be again dipped in Selenious & then another strip of Cu is to be stripped as Cu seems to take away the Se from Ni —

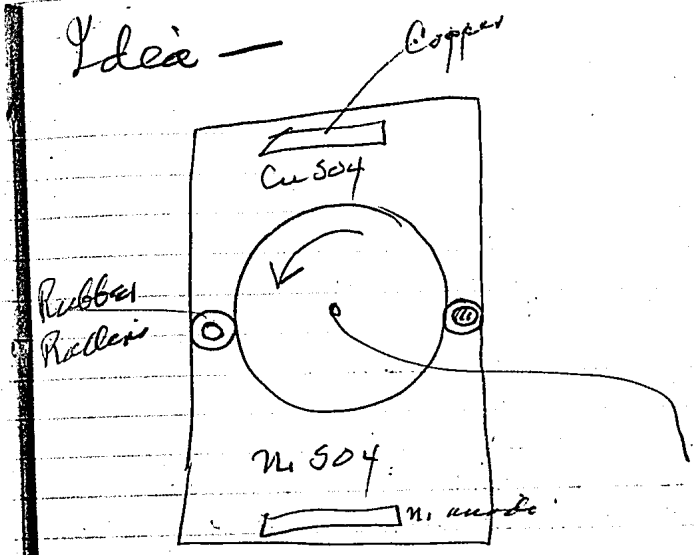
Conc Sulphate Magnesium made alkaline & filtered is not near as good a Conductor as Na_2SO_4 + it dont clean well — Another thing is that it takes a long time for the Selenious acid to give a film — ??

Note, Manganese sulfate mixes with $NiSO_4$ OK —

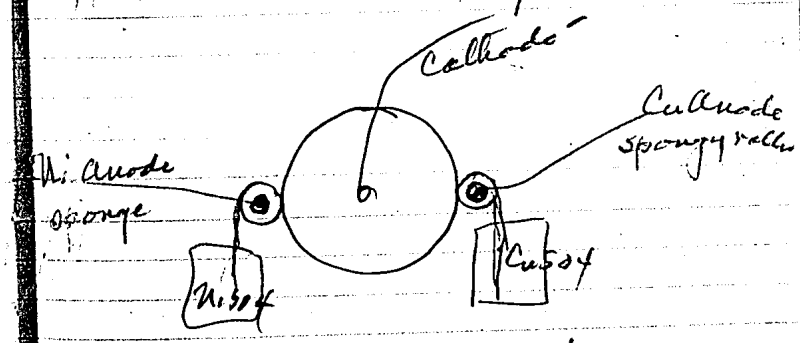
By using Ni anodes & Cathodes black peroxMn goes on anode & nickel on Cathode on Reverse Ni deposits on peroxide Mn & the previously deposited peroxMn is covered with nickel but after 2 Coverings it goes blow — & my think I have too much Manganese sulfate

When I put in $Ni(OH)_2$ it dont dissolve may be some action —

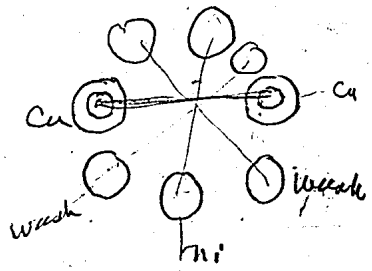
Idea —



Impracticable I guess



Might be more practicable.



Rotate instead of a Crane

June 17 1919

I coated Cu with nickel only 1/5 the usual amount then deposited copper on it & when thick enough filed edges & tried to strip it didnt strip as the nickel split itself a very thin film Ni sticking to Se Cathode & other part Ni sticking to peeled off Copper —

This Ni originally plated was at times taken out of bath in some changes

Phenomenon — If Ni + plated & then taken out of bath & exposed to air & then put back & more Ni plated these 2 layers do not adhere except mechanically by warts —

Therefore while plating Ni its Continuous plating must not be interrupted (1e) the Current must not be broken & it must not be removed from the bath, or removed & washed in water, as the two layers will not ahead & when stripping the first Ni layer well stay on the Selenium face & the 2 nickel layers will separate

I will not determine the exact phenomenon so as to know what to avoid

No 1 Cathode 100 ma Cu-filmed rod in Selenious acid (previously cleaned by Na_2SO_4 graphite elec slightly alkaline — then in Conc $NiSO_4$ + free $Ni(OH)_2$

100 ma - 10 am - out 1020 am washed + quickly put in Reg Copper plating solution

This stripped perfect.

No 2 treated as No 1
in Nickel sol at 10 26 am
at 11 am 100 ma opened the current
till 1125 then closed
it and plated more Ni
at 12 noon washed & put
in Copper sol

This stripped perfectly
leaving cathode with
nice light Se film on
both sides stripped OK

Note =

Potassium Cyanide
strong reducer of Selenium
yellow metallic —

see how weak it will do it

tried — Even a very weak
solution will remove it
in a few seconds —

Get time of removal of
a 1% solution —

Note. Copper put in KOH or
NaOH, turns black above
liquid & red below & is
attacked & dissolves —

If put in alkali in closed
bottle & no air gets
not attacked in slightest

No 3 in treated same as #1.
in 100 ma nickel bath at 1205 pm
out & washed well at hydrant
then distilled water & put
back again plating nickel
at 1235 pm — second coat
nickel on at 1255, washed
put in Copper solution

This stripped perfect

C(97)

No 4 treated same as # 1
Nickel plated in at 1.54 pm —
100 ma out 2.27. washed
& hung up to dry while wet.

hung up at 2 27 dry

2.35 — then put back in
Nickel bath 100 ma —
till 3 pm then put in
Copper bath —

Then stripped off bath
sides perfect leaving
light Sz film

Continued Book
2 Final Exports

Notebook Series -- Notebooks by Edison
Notebook, N-19-06-18

This notebook was used by Edison during June-August 1919. The entries in the first half of the book are a continuation of the electroplating, electrolytic cleaning, and dip cleaning experiments in N-19-05-28. These experiments formed part of Edison's efforts to improve the commercial manufacturing processes involved in making disc records, which included attempts to reuse master matrices for making more generations of molds from one recording. The entries in the middle of the book pertain to a variety of subjects, including the recovery of nickel flake after cleaning storage batteries, experiments to reclaim nickel sulphate out of "nickel iron mud" from waste water at factories, and additional experiments relative to disc record manufacture. One entry describes tests of a "whirler" for removing water from disc records to dry them for varnishing. There is also an entry with a series of "questions to ask a chemist." The last part of the book describes experiments that began a "campaign to produce a starting storage battery for Ford cars to beat the lead" batteries made by other manufacturers. These experiments indicate the convergence of Edison's work on battery and disc record manufacture in terms of electroplating. The experiments on a starter battery and electroplating are continued in N-19-08-26. The notes indicate that Adolph F. Gall, John McMullen, Walter H. Miller, Frederick P. Ott, and Ludwig F. (Louis) Ott assisted Edison. The front cover is labeled "No 2 General Experiments June 17 1919." The pages are unnumbered. Approximately 120 pages have been used.

3.785 cc m 9

gallon

81082
Ames Co.,
MFG. STATIONERS,
95 JOHN ST.

June 18 1919

10 am

Plating nickel even thin on a Copper Cathode filmed with Selenium & then electroplating & putting another thin film of Ni over 1st Ni & subsequently plating with thick Copper is OK - also when washed & dried between the 2 nickel coats,

Also when allowed to remain in bath without Current for ½ hour & then resume plating —

In fact none of the likely neglects will interfere with the ultimate result

Note that in stripping Copper from a Copper filmed with Se

none of the Copper Selenium film is transferred to the plated film to amount to anything for 6 or 8 stripping. But when metal is stripped it takes some of the Se film as is seen by lightening the color of film left on the Copper hence probably only 3 stripping can be taken before

a slight redip in selenious acid is necessary

Note To test porosity of Matrix of Copper - dip in 75% HNO_3 3 seconds but first clean surface by Current in Na_2SO_4 (alkaline) —

June 18 1919 #1 new press

First matrix, (Lucite) cleaned in new bath 3 on bench —
Graphite Electrode only
17 amperes — 16 volts in series
Washed by power spray
strong a low angle then
rinsed with distilled
water — Then put in
8 qual 450 cc of 5% Schumacher
acid bath in hard rubber
filtered, 2½ minutes
Red Castile, washed
with spray then
distilled water —

dried, then one coat Condemit
Varnish on back to 1/4"
of Edge — next morning
a second Coat put on
& given to gall to make
full thick matrix
formate —

The cleaning bath is
Conc Na_2SO_4 — just
colors red litmus blue
filtered thru sand
17 amp is not enough

June 19 1919

This morning put graphite anode with 2½ @ 3" of revolving disc at angle Tack cut felter cloth partition –

Put wash jets above –

also multiple wired cells so there is 8 cells on this gives 45 to 50 amp on ½ disc which is ample for cleaning –

We are getting ready for #2 disc +

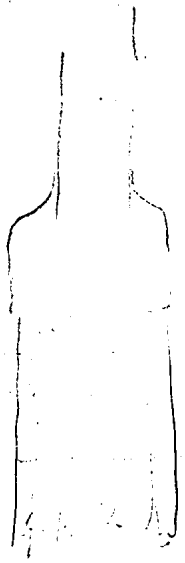
No 2

Cleaning 40 amp for 5 min – washed

#2 stained 3 Lithospalo not reddened - probably excess Wash could need a trouble brush for removing excess which have dried on matrix as water gels do not remove them -

with strong spray. Then distilled water -
Transferred to Selenium bath, 4 minutes -
Very deep red verging on blue, Washed with spray, then distilled water. Then allowed to dry - after dry painted with Condensite Varnish - (No lamp black) thinned down by alcohol
As #2 dries it turns more blue - think

6/19/19



Took black bristle brush cut 1/2 inch off – This makes it differ 4 well

use this one No 3 before

Electric Cleaning & in water get to detach any dried on dirt that will not come off with water jet or Hydrogen

3 minutes we see will answer

1/2 hour after taking from bath & dry it is all blue conferming that 3 minutes immersion in Deionized acid bath is sufficient

Started breathing back with 1st Coat Vacuum 11 am finished 11 15. will let it dry till 1 pm —

at 1 put on 2nd Coat,

#3 Disc

Cleaned 5 minutes in Na_2SO_4 (alkaline).
Then washed and brushed under spray of water to detach and particles which stick — Then washed distilled water,

I noticed this time that the disc got darker on immersion especially the back —

Sulphur is certainly coming out of rubber bath, as a small cleaned strip of green experimental catch held in bath for 1 3/4 hour turned red & one place blue —

We have got to get rid of Rubber —

#3 was in cleaning solution & was not brightened at any back was to grac wash in 5 minutes, 40 amperes

Washed & used the bristle brush while being washed,

The immersed in Selenium bath 3 minutes, its red before drying-

Only one uncovered spot shows about .010 dia-

Brush may not be stiff enough - probably wants Scrubbing brush bristles-

With 3 min immersion in Se it does not turn blue on drying but the red shade deepens after 1/2 hours dry its nearly blue so 2 3/4 to 3 min is OK

3 pm fred started rubbing on 1st Coat Varnish on back

June 19 1919

#3 went over to Hall at 5 30 pm

We now have a white enamelled bath which we will replace the rubber – Cost 3 98/100 at Hayne Newark – getting overflow part in + suspension for chuck of graphite –

I left a ¼ of a dollar
Silver piece in Solution of Caustic
Reg Solution I been using
48 hours, it is not attacked

June 21 1919

Just made a test with Na_2SO_4
10 with, to see about alkalinity
Solution is neutral –

If 1 cc of 20% NaOH is
is used to 100 cc of Na_2SO_4
nearly saturated it turns
Red Litmus strongly blue –

Hence I think One per cent
of 20% NaOH to 100 per ct of
Na_2SO_4 is OK for Electric
Cleaning –

This will take off grease
at its maximum solubility

1st Female came off OK - paint
not very good lots coats
but these easily colorized so
the build up them on one hour +
Selenium on — put on 2
more coats on top of 1st
Varnish 1 1/4 hour drying
between each coat before
going to Potts —
Some roughness pulled off in 1/4 @ 1/2 hr
Some varnish in getting it into off —

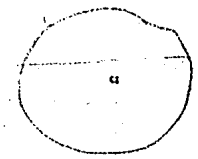
The Na_2SO_4 alone in the regular
with iron post + anod, left 36
hours, the solution full Fe_2O_3 ppt
I then put 1% NaOH in +
started following it came
clear in 2 hours —

Note this Matrix
(washed after cleaning
after 4/8)

4

I notice that this disc blackened ½ when in the Solution.

There was an open cement + while rotating the Cement went on we found ½ black



Kept it on for 5 min. then washed used bristle brush while washing then put in 4/8 for 3½ min washed + Brushed while washing — dried ½ deep blue ½ red there are several opals not 4/8 apparently also lot of finger marks on Edge —

Hereafter Gall will clean with alcohol & Vienna lime to remove finger marks

The cleaning solution is
25 Litres Na_2SO_4 - 4 lbs
or had 350 cc of 20%
Electrolyte added in it but
I find this is not alkaline
enough it does clean in
this - alkali probably not
strong enough to remove
grease I have now
added 100 cc more of
NaOH. - Making 25 Litres
Na_2SO_4 solution and 0 and
or 450 cc 20% NaOH.
But after running a while
Lilian shows this is not
strong enough alkaline
added 100 cc more NaOH
Altogether 550 cc
or 2.2% NaOH 20%

#5

Is the old matrix we been using to adjust by. it got black than lighter than black — the tried clean with Ray + weak Nitric Conduct, finally sent over to have it cleaned by hand with Vienna lime

Cleaned in Sol 4 min trucked —
Then in 4/8 3 $\frac{1}{2}$ min deep seed — Didn't Enough
washed distilled water

washed + dried & note a
lot of 020 bright spots
like
they [illegible]
wash in 4/8 sol ant
Repeat sol away from Cu
in solution – Transferred
& sent to Gale –
Both baths worked OK
Cleaning bath fully
alkaline + clear
At 600 Rev dries in 1 3/4
minutes – this will
adapt –

June 25 1919

We just tested a whirler for whirling water off disc after final washing to dry disc for examining the crack –

After whirling it took $2\frac{1}{2}$ minutes for disc to be bone dry – The speed was rather slow –

We will speed it up a little –

June 26 1919

Got 3 female murders, holder wrong had fix them —
Noticed finger marks all around Edge — Electro Cleaning does not take them off — Cleaned 5 min brushed, washed & put in 8/4 3½ min —
finger marks on both No 1 & 2 dont come off —
Something well have to be done to stop

This — #3 female
has marks from fingers &
something else - or shows
bright 3/8 dia when head
is fixed — its at Edge of
music —
The Matrix is spaced
by a big 5" scratch
clear across music
Note = #1 was turned on
back but #2 & 3
female not turned
Feed is pulling on 3
Coats of undituled Varnish

June 27 1919

Last night I left a clean Copper strip (part of medium) in 20% NaOH Electrolyte used by S B Cobb & found after 15 hours it was dark brown almost black

Another strip in Conc Na_2SO_4 was still bright.

Showing that our blackening bracteas is from NaOH —

& OH deposited

black on platina dish from platina made in the 20% NaOH, a deep black, but it requires high current low density does not bring it out. He found it was iron

Last night we sent 3 female workers over for Nickel plating after 14 hours they were not bent & plating was going

on OK - but the only reason is that the plating is full of Fe_2O_3 specs which float in the bright & cover all parts not as well as metal - it is this spongy material going into the plated Ni that reduces the strain & prevents cracking

Because if we filter the solution the Ni is very bright even after 24 hours at 1 amp but the strain is so great it cracks -

I must find some way to reduce the strain & increase the current density

June 27 1919

Took 3 more made such matrix
Washed & brushed, Cleaned
Electrolytically in Na_2SO_4
Conc (alkaline)
5 minutes washed rinsed
distilled water

Put in 8/4 - but this has
weakened by the 5 discussed
& by the Nickel tap on
affairs Required 4½
to 5½ min for light red
washed, rinsed distilled water
dried in new Tin cabinet

Ready for Varnishing -

These 3 took better than
the 1 to 5 = have less
finger marks Ela

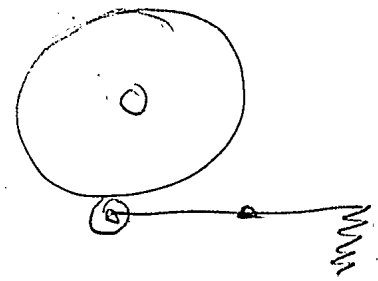
(51)

They are numbered
6 7 + 8 – Male –

~~Here~~

Have struck a snag –
it seems that the first
female from a Master
comes off OK but when
the Master is turned off
at Edge to separate the
2nd female, they turn off
the 8/4 film hence when
put in bath has to be
turned down more
hereafter we must

make Edges after separating
8/4 blue —



purpose run dense 1 Rev
in 2 to 4 minutes left.
which wet with weaning
strong 8/4 solution —
hence Edges a shade
thicker will get film

Above will work but get
better thing - by using
5% Se Solution without

28 June 1919

vertical detection it acts
instantly. We use 1/16" hair
Camel hair brush + minimum
of liquid no drop but what
is held by Capillarity between
the hairs by painting the
Edge + varnish side + a little
over 1/32 or less on mirror
side it leaves no sticking
We will do this each time
a stripping takes place
as we must turn film off
on Edge to get stripping

Later June 30 1919
Conc 5% Sol of Se
was too slow for painting
Edge as on preparation showed
some free Selen.
I am now using
75 parts water
25 " of 5% Sol of Selenous
acid. This gives a deep
fine red ——

Later, July 28 - above Sol
is OK

I painted a straight line on
a small Cutlike line not
.020 wide — also a edge
without clipping a bit
on either Edge more than
.005 - ~~at~~ it covered in
Copper bath perfectly
was quick as the unbroaded
parts —
This was adopt.
But I think, may have
to weaken the 5% Se
to 2½ or even 1½
as in time it will foul

the bath, however the Copper anode will stop it but depositing it out of the solution, in fact we could put some sheet Copper in Crocks –

Note, a Cone Sol of K_2Off. turns a cleaned Cathode (by Elec) very quickly a deep yellow,

9-10-11 Masters

(Dec 6)

all the same look fair
& even - some finger marks
on edges - 5 min cleaning
& 1 was 10 min in 8/4
being weak - strengthened
8/4 & colored other
2 deepened in 2½
minutes -
~~yes~~ varnished ok -
Polished -
These should be
greed

S Battery - Jan 30 1916

Recovered flake is brown a red color after cleaning at Langley Battery & finishing with acid —

I tried many things but of no avail for cleaning it bright finally lucky thought was to use Oxalic acid 1½% sol, warm —

The oxalic ~~[illegible]~~ acts on the nickel but oxalate thus being insoluble is deposited with flake underneath the dark covering to prevent expansion mechanically removes the dark film then by agitation the oxalate of Ni is readily removed by decantation & washing several times, finally Ammonia is put in water with flake — this combines

with the oxalic & become very soluble & the whole is washed free leaving the flake as bright & clean as new flake. This proves 40 C per cell & recovers us to use old flake —

The batch of old flake in beaker on pie plate on hot plate goes very much quicker than cold,

We should have to use heat probably 150° F to get quick action

The solution in each beaker is 750 cc 1.33% Oxalic —

This is more than enough after drying twice weigh the flake

June 30 1919

Note use of 75 pts H_2O
25 pts of 5% vol
determined for
Painting Edges of Mantles
& female Mantles

Think 1% or even 1/2 %
solution of Oxalic acid
not hot or concentrated,
flake very bright —

~~June~~ 31 1919
July 1 —

The flake from stronger
Oxalic was best, better
than 1500 cc 10 grms
Oxalic 24 hours —

I now adopt 20 grms
Oxalic 1500 cc water
100° Fahr 24 hours to 50 gallons
then agitate with paddle
& decant after settling —
2500 cc Extra water dilute
this until only little
milk — then add slowly
to the 50 grms flake 50

Add Ammonia – 8 hours
with some agitation.
Then decant off the
Oxalate of Nickel –
Then add Excess water
& wash free of
Ni Oxalate.
While Excess water
out in a Centrifuge
& dry —

July 3 1919 Glory! S S

Have got prints off 3 working moulds which were made by new 8/4 process—
1st a metallic submaster—
8/4 then female Matrix—
then 8/4 then Nickel 004
+ backed by Copper Turned
+ put in Reg working moulds & prints on Condensite made
The General surface Considerably better than by regular process
yet 1 Celluloid present intervened

Note, They have been in habit of grinding submasters We shall not need to do this when 8/4 process is used —

JP

When we work direct from the Master itself we are quite sure the general surface will be so reduced that only surface will be the original wax surface & the blank surface — the start is good —

JCG

July 3 1919

Walter Miller made 2 tracked blanks these were grafted + plated + mounted in clam for cleaning —

Put in cleaning Electrobath + cleaned 4 minutes 5a amp — think 2 or 3 mins enough — look fine no finger marks on edge

Washed them in 8/4 - to dark red, washed dried in colander + sent to Mac Thursday PM

July 6th

Standard painting solution with Brush is

75 parts Water
25 " of a 5% solution of S/4

Think these will come out perfect,

The latest is that the Center of Matrix stick - Gall thinks the Canal Rolled Copper he uses in Center not get S/4 Enough so hereafter we will paint Center. where Canal Copper is with brush 4 S/4 25% of 5% solution

I made about 5% sol of KCy & with the strips of matrix, cleaned it Electrolytically — Coated it with 8/4 7 times washed & Each time dipped in the KCy, which almost instantly removed the blue film of 8/4 — The 7 layers didn't appear to remove any of the record waves

they were smooth & all that I could see that was done was the polish was gone Dont think the 7 dips & removal took 1/100000 of inch off. -

This shows film from a Matrix was 68 removed by a 2 or 3 second dip in 5% KCy Solution - after

removal should be
wiped with cloth &
washed in cylinder

July 8th – The 2 females
from tracked matrix came
out apparently without
finger marks & OK
Cleaned & S/Kd & returned
them to Mac for coking
mould plating –
So far OK –

July 19 1919

Process for obtaining Nickel Sulphate out of Nickel iron mud from waste wash water at Sta Works, Thereon down by Carb Soda

1st Be certain there is an Excess of Carb Soda used to insure precipitation of all the Nickel as Carbonate

2d See that before press is unloaded that all the Sulphates + Carbonates of Soda is washed out of filter press Cake, not all but only slight amount left as it will contaminate the Ni Sulfate

3rd Put the Mud pest as it comes from the press into a Tank steam heated, Tank lead lined, also stirrer

4th Add enough water to make a thin pulp, stirring stirrer.

5th Gradually add 50/50 H_2SO_4 while stirring pulp water heated 180 to 212° until from previous qualitative test of Mud you have nearly enough added Run until test sample doesent lead turn black

6th When neutral add Cautiously a little more acid & again till neutral a time will come when

the last addition of acid will not run to neutral — The solution will be acid.

Its essential that towards the end the acid should be added in very small quantity

Avoid at the end too much free acid, as the amount of iron going into solution rapidly increases with the acidity.

Should a mistake be made & get too acid a little Carb Soda should be used to make it not redden blue litmus. Then there will be only a little iron in solution & the mix will not attack the filter pieces

The liquid which comes out of the filter press will be rather strong H_2SO_4 with some ferrous sulphate — When no more liquid will come out of cake at the pump pressure add a little wash water, then more wash water until the liquid is a light green —

After that put on more wash water but do not let it go into the first washings

Shunt it to another Tank

This weak solution can be put into the next tank lot,

The strong solution & the several small washings of press are put into a lead lined tank with lead lined stirrer & brought to boiling by steam jacket —

Add to solution a small quantity of Nitric acid to peroxidize the ferrous sulphate to ferric sulfate by test be sure that solution is fully peroxidized -

Now add a small quantity of Nickel hydroxide very finely divided - the dust $Ni(OH)_2$ from precipitation of Nickel hydrox at factory is ok Keep boiling -

The Ni hydrox will replace the ferric hydroxide & form sulphate of Ni. & the ferric hydroxide will be thrown out as a precipitate,

By testing from time to time by adding an excess of ammonia to a small sample of the Ni. solution

you can ascertain if all of the ferric hydrox is pre-
The solution can then be ~~[illegible]~~ run through a filter press,
If the washing of the original mud has been well done & all the free sulphuric or Carbonate of soda been washed out
& the peroxidizing of the iron sol properly done & the adding of nickel hydroxide properly done so all the iron is thrown out
The solution will be pure Concl Ni sulfate which may be concentrated to proper spec g or further Conc & crystallized

or made unto Mi Wthy selfalle.

July 19 1919

The working moulds of the 2 tracked blanks containing piano & intervals of silence caused them OK could not be better

Made prints, both had about same surface on any blank. only 1 cracks noticeable on each Public would never notice, One had several small cracks that could hear by using lens The other had hardly any The surface was good & that due to fibre in blank, The start was as good as the other parts, almost second & 2 over heard without lead cracks start,

When printed on a Dally blank surface is right near the limits of my hearing with the horn Dally's blank was hurried very screened thru 30 mesh 2 coats varnish -

I all got them as good

[1919]

as this, it leaves nothing more to be desired —

Carbonate of Copper precip from wash water from plating nickel flake —

This is worked the same as the Ni 72 method to get iron out,

The tanks should not be lead lined but Copper.

The stirrer tank should be Copper =

The solution of Cupric hydrate in Cyanide takes out all the iron even when the solution is a little acid. This acidity probably due to fact $CuSO_4$ itself is a Cyanide and — While I read

Note,
The Carb Cu from
S Britany is badly
Contaminated with
Iron, as bad as
Mt Fe Mud but it
dont show up
in mud like the Mt Fe
mud -

Possibly wood lack +
wooden stirrer might
be practicable —

Copper hydroxide to dissolve
the Fe, I think Carb Copper
must be dirty could be
used instead —
Because moves all precipitated
by Nitric added to filtered
solution but only just enough
~~[illegible]~~ Fe as any
Excess will have to be
neutralized by $Cu(OH)_2$

Wooden filter presses
will have to be lined
or Copper Linen cannot
be used as it is attacked by
Copper Oxy + it also puts
iron back in solution -

The solution of Fe free
$CuSO_4$ should be pumped
at Badenoch Count +
put in Crystallizing
Vats,

Note,

If I amalgamate the Nickel (Cond) with sodium amalgam in a large spot, then put in 1/2 strength hypochlorite + 200 Ma amp it copes practically all the surface amalgamated + very little of the other surface showing a cleaning action of the Hg.
HCl, H_2SO_4 Cathoding does not remove the negative protective Chemical of Nickel but apparently Amalgamating does —

Instead of Sodium amalgam think can use $HgCl_2$ in acid to amalgamate the Nickel Wash quick + transfer to Hypochlorite running bath say 25 Ma amp per inch

As to the adherence of Peroxide Ni_2 I rubbed fingers over surface + then washed, the 50%

Clung to anode when violently washed, the whole amalgamated spot was black —

It requires considerable time to form good adherent scale

Note Perhaps can use Nickel ~~p~~ coated black adherent $Ni(OH)_3$ or Sheet Zinc in 20% NaOH.
providing NaOH pure

After running over anode with amalgamated spot + cleaning + washing put it back at 200 Ma amperes after 1/2 hour removed + run finger over a several times, carefully found deposit had increased in thickness, put it back again — Spot is under probably creeping of Hg

VERY PROMISING

Questions for Chemist -

about how many [illegible] of water per lb of food [illegible] Evaporated in the [illegible] of Triple effect vacuum evaporator,

I precipitating [illegible] double decomposition [illegible] to it generally [illegible] to add an [illegible] precipitant for [illegible] trouble,

What is object of [illegible] a precipitate

What is [illegible] used for,

What is the special chemical substance used for detecting nickel -

Questions -

In filtering in Laboratory using Bunsen Vacuum filter with water ~~[illegible]~~ filter paper discs are used, suppose the substance somewhat attacks the paper + breaks it at the holes How do you obviate this -

How would you determine the Viscosity for instance of a liquid Varnish

Questions -

What is a reflex Condenser

Which gives the purest Crystals large crystals by slow Evaporation of very rapid Crystallization & small Crystals

How do you get small Crystals & how do you get large Crystals,

Questions.

What is principal impurities in Chamber acid (Sulphuric) made by the old process from Pyrites —

July 22 19

Wash water used per cycle in flake Dept.

Copper	3.46 gal
Ni	3.37 "
Total	6.83 "

19 Cranes in work 9 hour day
average number of strippings daily 2.75
Total strippings 46.75
Total plating cycles per day 5843 — (of 125 cycles per stripping)
Water used 42075 gals

Scheme –

Ni anode
Fe anode

Scotch –

Saturated 75% $NiSO_4$
" 25% $FeSO_4$

In plating use Ni anode
20 min Iron anode 5 min
so keep Fe constant in
solution – In the following
bags have iron wire chopped
up to keep solution in
ferrous state & good
circulation –

Note – July 22/19

McMullen up to now has taken 2 working mandels from the 2 cracked blanks (ie) 2 from each. I then recleaned them in 8/4 – to light red they were a little dead & made the shade deeper – Find not clean in NaOH. Eckline on red and varnish on –

Mac has other females from the master of black blanks now in plating –

Hereafter WCC refilm right along. after 2 working mandels taken off –

Note, it is surprising how little the black oxide of $Ni(OH)_3$ is attacked by H_2SO_4 — in the cold

Also oxalic acid Conc does not appear to attack it in the Cold —

~~Then~~

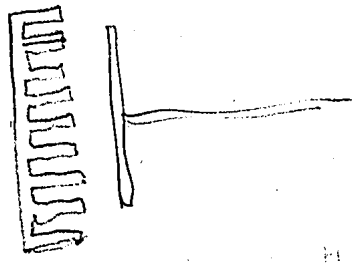
In plating with 75% $NiSO_4$ + 25% $FeSO_4$ | Nickel anode & iron tacks in solution, I find large amount of black deposit on top This is ferric hydroxide —

The Cause is that the hard rolled nickel is not properly attacked by the SO_3 ion hence this Oxidizes the iron to ferric

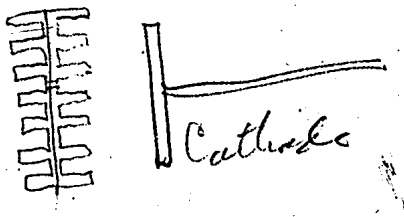
It is essential that either the anode should be rich in iron so Ni is easily attacked or Cast Ni anode used & a separate iron anode used to prevent Oxidizer —

Later = Think the best idea is to use say ~~[illegible]~~ anodes the surface of which gives 4 times less density of Current than the Cathode, the greater the size

of the anode as compared to the Cathode the less rock of the tendency of hardening from SO_3 given off & less from ferric oxide —

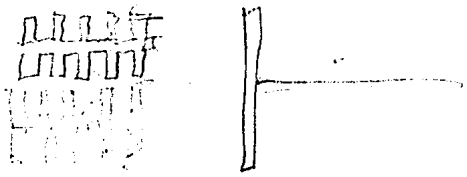


Holes Torn



Anode

or



Note =

Nickel will reduce copper to metal slowly from a $NiSO_4$ sol containing a little Copper Sulphate, ? ?

Note 48 hours on hot plate on asbestos disc - Nickel powder to reduce all the Ni to green state EVEN made of rolls not disintegrated, The disintegration is only 50%

It may be possible that
Nucleus from an old
Cell might be entirely
regenerated in capacity by
subjecting them to this
vitalization by themselves

Important to try

S

Aug 15 1919

Am now going to run a Campaign to produce a Starting Storage Battery for Ford Cars to beat the lead,

Probably have to use Cobalt both poles —

To add to regular tubes & iron plates in the cell a group of plates with thin coating of Cobalt Oxide each pole & Close together These plates have small capacity but gives an enormous discharge Current for starting & nearly Exhausted after starting a few times are too Lead to keep lights going the Regular plates

will be drawn on ~~to~~

The CuO put together with 8% dehydrated H_2SO_4 — from Silver Lake makes strong acid — don't guess much blue

Soaked in water several hours then in NaOH 20% hardly any blue comes out was on hot plate on butter dish — they came out later —

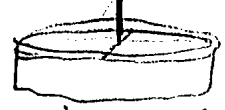
Note Must determine on both sulphur & iron plates which is best to first soak in water or NaOH, 20%

Aug 16 1919

Took an 8% sulphur 2" disc CuO, 20 drops 1 ft 3 drops 3' Soaked several hours in water removed water once, then put in NaOH 20% Tube still strong — Emptied out NaOH 20% & put in fresh — all on hot plate on butter dish —

Aug 16 1919

Expmts on plating Ni from Conc $NiSO_4$ — with the rotating Cathode



3¼ dia 1" wide Varnished all over except 1" face coated 8/4 — plain $NiSO_4$ peels at 1 amp density in 30 min —

with a little of Dewoddis dope, peels at 40 minutes at Edges, with several times more dope, 25 cc of a 10% sol Dont peel at all at 40 min its now running again after removing & washing

Outer surface very shiny no matter

With the 25 cc of dope it starts
Cracking at 60 minutes ~ —
1 hour at 1 amp gives thickness
8/10th mch — its more brittle than
without dope. Don't think
Can use any more on account
of this brittleness, will add
25 cc more monday & try it
& then go on other schemes —
should go 1 hour at 1 amp
OK —

Put 50 cc more Dimroddice
dope in making about
75 cc — previously filtered
the solution,

On. 243 1/2 amp for 5 min then 1 amp

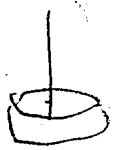
Look at it 3,37 pm — Runs 120 Res min
2 min off. well broke. off 3 35 not
Cracked but edges look a little
that way put it back lost 1 min
3.37 OK put back till 4 stopped.

Aug 18 1918

Ni Strips 1/16 holes 2 strips on 20%
NaOH Holes filled with
Colart reduced by H,
Charged + discharged,
only small momentum
Current on short circ
then amular.
Charged 1/2 amp —

Evidently necessary
with the reduced in
holes — or make the Co
by H Extremely fine,

Later Hydrate all comes
out on. 6 M.amp
will try Co by H again as I
had too high density well was
6 M amp —



with 100 cc of strong Dimondale dope

Can plate 1 hour at 1 amp before cracking this is at rate of 8 amp per disc

This is about limit for this combination,

Very polished - not so very brittle but crazy & sharp bend

Calliper 1.4/1000 - seems had many cracks - probably 1/1000 limit at this density,

Aug 19 - 1919

On 1 amp - $NiSO_4$ 100 cc strong dope -

120 deg Fahr -

1217 pm Calliper 1.25 -

Density is about 100 Milamp per inch -

Off 217 - quite thick only peeled off Edges some places in 1/8 but really OK -

Summed all bubbled up wont stand 120° Fahr -

This Ni is very difficult to peel off its very brittle & ng

There is nothing much in Dope it helps a little - Hot also helps

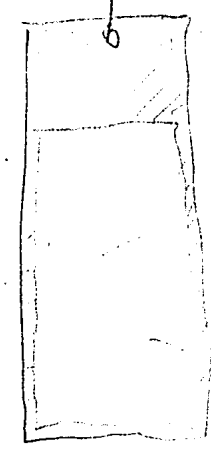
next page

Zone, should say that
heat. 120 + 100 cc dope
Coned 50 amp square inch
for 5 or 6 hours 2 or 3 times
Better than Normal Temp 16 deg
But heat is objectionable
as is strong dope —
Well now try Cone
NiCl at normal Temp —

Nearly Sat NiCl — 17% metal to
100 cc liquid —
On 440 & 540 — nothing
but Cu plated on & thin at
that — 1/2/1000

Aug 20 1919

Experiments to increase density of Cuprous & prevent peeling of Nickel



2" Copper

Surface approx 2"

Cone H_2SO_4 [illegible] temp

Started peel at edges in 30 min - 200 ma/amp

No 2 nearly saturated Sol of Nickel Chl found it all peeled bad in 40 min at 200 mil amp – deposit Copperish as if some impurity in it –

Made it 1/2 strength by water on 6 pm – Called away went 1 hour 20 min found it peeled to bright deposit now

Will repeat

Started another in the 1/2 strength NiCl Sol.

8.27. – 858 30 mins peeled, + brownish must be some impurity This is not so good as sulfate –

By nickel plating process a solution, This nickel made anode in Hypochlorite of soda (old) Covered with black Nickel hydrate + rough surface is pretty adherent. Think this can be made ok if formed + then washed + dried –

Think you could not detach it VERY PROMISING

See 19 sheets back

With nearly all hypochlorite (old) & very little salt builds up on plated Nickel in strongly adherent black oxide at 1/2 amp density it starts in dots which gradually increase in size until in center electrode almost covered with them —
Wants strong fresh hypo & perhaps salt more or less as time,
Very promising for "food starter,
I found if put in NaOH 20%

and 1½ amperes used it being thought that it don't detach any it very adherent so hard get off with finger nail & OK

I now reverse & make it Cathode using 1½ amp to get recovered gassing to see how much detached 90% still on the nickel plated on the Copper too thin, went thru to Copper

tomorrow plate Copper thick
& then form it in strong
hypo & pass it as anode &
Cathode

The total capacity against
Iron pockets in 18% KaOH
2 Li OH, -

11 25 pm 20th Aug 1919
good Night

Fresh hypochlorite Soda strength
for peroxidizing 25 grms iron
per Litre of Hypo

This on plated Nickel forms
the black dots of Nickel hydrat
rather freely, & Coul G. made it
work dots flatten & increase
in size and most adhere even
with gas coming off

Either as Cathode or anode

Will try salt & other Chemicals
in it. Its probable also
that if coarsher & thicker it
will stick to iron adherent.

I am trying to get it covered
all over & not with dots —

Iodine in Alcohol Matters the
Ni but dots do not form any
quicker,

Chlorate Na + free NaOH, dont
work.

Fluoride soda NaOH
no good,

First dark all over Even
blackening on Coral metal
Strong Sol of Nitrate Soda
& fresh Hypochlorite Soda
Make all kinds Experiments on
this — $NaNO_3$ very impure
get pure — Later Even with pure
$NaNO_3$ do not Gather

The spots I guess are holes in the nickel plating giving access to the copper & the copper hydrox that comes ~~off~~ thru holes & is so tenacious
Use solid Ni & see if get it —

Glucose 50 grms (dry anhydrous)
50 grammes of old mix from tubes mostly pencils on hot 4 drops oil butter dish 4 few hours direct on hot plate.

200 cc water

10 grms 20% NaOH
is 90% etalurgically operated then 10 needed in later —
The balance 10% in 5% H_2SO_4 ord temp after 2 drops & a little agitation is also all operated
This makes a very satisfactory ~~[illegible]~~ process practically hardly any flake broken up more by this process
probably 24 hours at 212
Will be sufficient & probably less glucose will be necessary

I find the one that has only 25 grms only glucose is just as good, probably Even less glucose will do

Spots come also on solid nickel

Got 100 ma from the spotted Ni probably 1/2 sq. in would be area of black. Used Zinc to discharge it. No gas then suddenly gas after 10 min at 100 ma — Will hg up a discharger measuring Volts + amperes Transferring Electrodes from Corroded after washing to the cell for charging after washing not corrodes liquor, then Charge fully + transfer to Zinc discharger

The dotted Elec Cu Ni plated after formation, washed Charged 30 min 50 mil deep at discharge without gassing + kept Voltage up 15 min 50 amp suddenly gassed — I fear Copper interforming will deep with all Ni Electrodes —

Note.

~~Perhaps P + N Zinc plates amalgamate heavily one anode oxidized~~

Possibly Zinc + Nickel N Coated with heavy Coat Hg Oxide by anodizing put with Zinc — See what Voltage is — also provide means by pockets to lead Hg when reduced to metal or amalgamated Nickel

I notice Nickel as anode in NaOH 20% Saturated with HgO gives fine yellow coat of HgO — 1/2 amp max Coat

Aug 22 1919

Experiments on plating Nickel on 2 sqr inches of filmed 6/4 — also forming $Ni(NH_3)_2$ in solution

All solutions are nearly saturated $NiSO_4$.

To each solution is added 6 grms of a chemical

#9 — 6 grms Ferrous sulphate
1 hour 200 ma, all curled + dark

#10 6 grms Boric acid
one corner turned up + bottom inch darkened at 1 hour 200 ma — sheet is fairly tough tends sharp right edge
OK at Edge

#7 — 6 grms Cobalt sulfate
all peeled bad.

NOTE Aug 22 1919

So far Sodium Amalgam on nickel + forming in Hypochlorite most promising for coating surface Entirely with adherent Coating of black hyperoxide not rubbed off by finger –

Took anodes formed after soaking in water several hours + charged it 100 ma rate for in 20% having some Light

Then discharged it at 50 ma rate in 20% Containing a Little Light. using Zinc Neg pole –

Ford on anode

#8 peeled along the edges, all Edges but film as whole not peeled film thick, not quite so tough as #10.

So far #10. most promising Aug 22 1919

6 – Manganic sulphate 6 grams anode get black – fine plating best yet only two top edges turned up a little, all rest sharp + perfect Edges – This is more promising than # 10 – The peroxide of Mn is very adherent on the Nickel + may work on Ford starter as P Element

5 NG – all yellow scarcely any deposit, gases too NG – The anode is bright + corroded Very Considerably Dark yellow as Sodium Chromate

Note –

Possibly Manganese Peroxide coated on nickel could form with Zinc in 20% NaOH, a ford starter battery if on reduction the hydrox dont dissolve in the alkali

I put the MnO_2 in 20% a considerable flake off – this could be stopped by porous nickel on plate.

Ford – the Hg Amalgam Electrode, Charged 53 min at 100 ma amp gave on discharge with Zinc 40 min at 50 ma amp – then when I tried to keep 50 ma rate up by lowering resistance it gassed + some few black flakes were detached 5300 ma minutes – gives 2000 ma minutes rather low efficiency 40% but this can be improved!

Now recharging at 100 ma only went 2500 ma minutes before gassing

Now discharging 50 ma

#1 250 NaSoy Sat — 6 grms Sulphate Alumni — OK at 1 hour but could see tendency at top corners to peel — put in 20 minutes more peeled easily up — Solution Cloudy

Promising — try strength to acid —
bright + good donut slow might dimple (?)

It Calipered 1.8/1000 but squeezing down req Caliper to flatten out round wires went to 1/1000 which is very good for 1 hour according to this only requires 4 hours for 1/1000 the thickness required on dials. As these slips are very sensitive to peeling I think a dose would not peel at this density before 2 possibly 3 hours — if Dennidie dope not in 4 @ 5 hours — which would be sufficient

Ford – Amalgamated Ni by Na Amalgam then 100 Ma for 2 hours oxidizing. Dipped it against Zinc only lasted 2 min 50 MA

So far only Ni hydrox any good, 50% Efficiency But it may be better as Zn Voltage is higher, (1e) 170 Chg + 185 dipping with Zinc –

Ford, German Silver not attacked in Hypochlorite So but if a little NaCl put in its attacked in spots one spot 3/8 by 3/4 long attacked + deposited green coloured ones blackened by the Hypo-ClO dont seem strong enough material to attacked by using Cl from NaCl it attacks on rubbing the black off the spots form quite strong corrosion – Washed it off + put back instantly whole area of this big spot filled with green density 1.1/4 amp

#4=250 NiSO4.
6 grms Chromic sulphate.
blackens surface + does not deposit any nickel –

250 cc of
Silicofluoride Ni ~~[illegible]~~
no deposit of nickel black –
its very acid must get this right as other man did so –

Know neutralizing the Ni of Silf Ni by Ammonia + filter Enormous deposit of precipitated Si + Ni –
will try it again –

Later found German Silver has layer of Copper rolled on it — fake G.S. —

Tried, Thick pulp $NiSO_4$ pp by NaOH, both Electrodes showed on pulp + 1/2 amp put on in 20 mins Anode Entirely Cooked black both sides + does not wash off —

I am now discharging it 50 ma —

Plating —

Silico Fluoride Ni after nearly neutralizing pickled but peeled Easily — Not very brittle,

18 — $NiSO_4$ + 6 grms Sulphate Lithia, peeled around edge all way round, Nickel not tough won't bend much

Flake — The

10 cc 20% NaOH
25 grms dehydrated glucose
50 " from old Nickel tubes
200 cc Water
on boiler deck exposure

OK 98% thru 10 mesh — balance deposited by 2% H_2SO_4 —

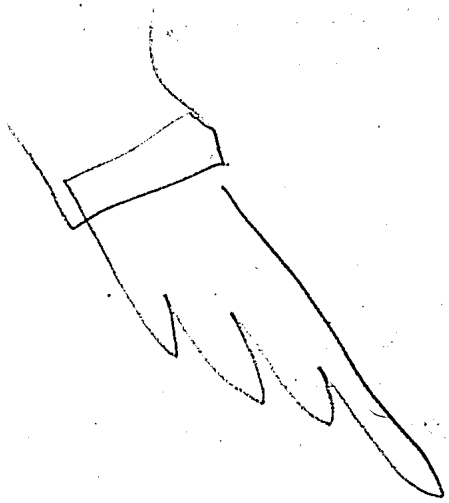
OK —

Oct 15 = 250 cc $NiSO_4$ + 6 grms Ammonia Chloride Ni peeled off - film perfect not cracked at Edges found it in bottom of Cell. Rolled up but perfect and cathode had a fresh nickel film on also perfect brilliance deposit as usual This is a PHENOMENON

Vary it.

Oct 22 250 cc $NiSO_4$ 6 grms Ammonia sulfate (12) solution All covered with black after peeling off found nickel film on but too thin to peel with knife NG

Oct 27 = 250 cc $NiSO_4$ 6 grms Hg Cy film lead color granular hardly any thickness May act as Ford gas off gas in plating



NOTE →

Oct 16 250cc $NiSO_4$ 6 grams Ammonium sulfate, peeled peculiarly 45 minutes, brittle

Oct 19 – 250cc $NiSO_4$ 6 grams Magnesium sulfate, peeled at edges 1" + corners turned up thick 45 min – rather tough ni –

Oct 13, 250cc $NiSO_4$ 12 grams Dibiscafluoride Not peeled, black streaks, Ni tougher than any yet

Something peculiar about this – PHENOMENON + Nancy

Collapses $1\frac{1}{2}$/1000 seconds 3 or 4 times longer than usual film

Ott #14 41 grms Potassium [illegible]
=[illegible] out most of the Ni but
slowly successfully any deposit
NG -
gases [illegible] -

Ott 12 - 250 cc $NiSO_4$
24 cc H_2O_2
All cooled looks like a film -
[illegible] coat yet.
gases carefully

Ott #21 250 cc $NiSO_4$ 6 grms
Ammonium [illegible] Nearly
Micro Cracks, Very thin film on NG
gases

20 – 250 cc $NiSO_4$ 6 grams
Glacial phosphoric acid.
Pickled up in 1 oz. poly 50 minutes
Tarnishing not as usual

Off 32 – Water + 75 grams $Ni(NO_3)$
neutral with $Ni(OH)_2$ = gases
Coated perfectly with what is
probably $Ni(OH)_2$ or a basic
salt. Sibelled up to $\frac{1}{32}$ thick
perhaps more not injured in
any way — Electrode put
in water clings a-gases
perfect deposit

PHENOMENON

May be field of Copper

Anode has what appears to be copper on parts

May be OK for Ford
after soaking 10 min put in forming bath
25 milamp ½ broke off other ½ in contact
DONT SWELL in NaOH!!

---

32 The [illegible]
is actually [illegible]
[illegible] $Ni(OH)_2$
dont swell in NaOH [illegible] Wonderful

Ott. 23 250cc NiSO4. + Calcium sulphate in excess - peeled probably 40 @ 45 min, little tougher than most, not prominent
No gas

Ott - 51 250cc NiSO4.
6 grams of Cyanam -
all peeled probably 30 minutes
No gas - [illegible]
as usual -

Ott 52 250cc NiSO4
3 grams Pyridin
Black - no nickel deposited
Anode bright.

54 OCL 250cc NiSO4
6 grams Potash alum
No all fine cracks Anode bright
+ dark - glycerin
should be neutral

(175)

Ford –

Great, $Ni(OH)_2$ deposits on Cathode in tenacious film which covers over all very perfect + Even. It charges with 25 ma on one inch of cathode in Sol. without gas seen It discharges for several minutes at 180 ma with Zinc + drops molarity to Zero of Zn Ni. metal,

Using 32. Nitrate Nickel made neutral by $Ni(OH)_2$ 250cc having 75 grms $Ni(NO_3)$ = its rather impure having considerable Copper

PHENOMENON

Ford Starter

Very adhesive electrodes should have holes to clinch it

Ott 46 250cc $NiSO_4$ 6 grms Ammonium Sulfate No nickel deposited — black film Anode about bright!

Ott. 72 – 250cc $NiSO_4$ 2 grms Ag. Sulfate, no deposit Ag was deposited but all came off as a sponge very finely divided May have a film oxide Ag on Anode –

Ott 64 250cc $NiSO_4$ 3 grms Mercuric Sulfate Spit off Early – bottle amalgamated Ng – Anode clean

PHENOMENON

If this adheres at light
It will be useful in to
make it stick to other
metals,

Does Chloral H affect Selenium
INVESTIGATE

Fine result Ni Fine Tough

Oct 55 250cc Ni SO4 1 hour
6 grms Chrome alum
1 hour no peel, put it back,
for 20 minutes, found it peeled
nearly off. Its Tough if bent
in 1/8 radius at right angles Cracks
a bit. PROMISING !

Very proportional.

Calipers hard pressed 1.3/1000

~~Nb Oct – 250cc Ni SO4~~
~~6 grms Chrome alum~~

~~Same 1 hour no peel 20 min~~
~~or 10 min 1 inch still~~
~~not peeled found it back for~~
~~more minutes but knocked to~~
~~pieces~~

after 2 hours no peel but I find
that the film sticks perfectly as if it
was integral thats the reason it
dont peel Horribly tired failed to
use 8/4 Try it again
Dup Ng was alive

Ford - Depositing $Ni(OH)_2$ on nickel if it has holes say 40/1000, + deposit on both sides Ni cathode being matte will give all that is wanted. On polished Ag Silver it deposits but tends to flake off when 200 ma for 1/2 hour at 200 ma rate if it had been matte + holes could probably gone to one hour per inch surface exposed or 2" with back - 100 ma per inch 1 hour is $\frac{1}{10}$ ampere per inch or 14 amp per sqr foot.

Aug 25 1919 -

We are now rigged up so we can plate Ni in 6 cells at once each a different solution, Have plated 30 already

53 3 gms formaldehyde alone

Cracked all over NG

61 = Cracked one edge one corner buffed NG Ni ok Ethyl Alcohol 6

62 Cracked all around Edges NG Methyl Alcohol 6

not springy

78 = 250 Ni SO4 6 Tartrate Soda
one edge lifted Very white
matte good nickel —
Very — When pulled off Curls
a little This comes bent at sharp right angles

Can crumple up
absolutely no spring to it

77 250 Ni SO4 6 Citrate Soda
Very white matte, fine ni —
one edge lifted away a very little
Strips perfect, Nickel sheet about
Curl — PROMISING Very ! ! S S
Very tough can bend sharp at
right angles without cracking.
This is longest Ni yet + so
Altogether the phenomenal result
Caliper 0.8 —

63 - Badly cracked all around
2 dg2 N.G. Recently Bad
6 acetone

= Promotheoics Herman Salt
~~Bent~~ Curled up at 4 Edges
also both sides + bottom —
after stripping it lays nearly
flat
Not so good as Citrate,
Collyers 1000'

---

88 — 250 $NiSO_4$ — Only Glucose 6
It has very little plated on
one place ~~bare~~ — find it had
stripped Early + fallen off
Very brittle NG

83 : 250 $NiSO_4$ 6 Na Carbonate
all stripped NG
Anode Red deposit.

73. 250 $NiSO_4$ — 3 gms Ag Nitrate
all slow came off has sponge
NG

60 250 Ni SO4 3 Hydrazine Sulfate
Cracked, hardly any NG —

76 - 250 Ni SO4 Dup 6 grms Chloral Hydrate
poor plating. Very thick + some come off - balance Cant be removed probably because deposit too thin NG.

96 - 3 grms Bromoform -
stripped off completely, cracked all around Edges At a 2nd Coat started all over NG

92 6 grms Sodium Pyrophosphate
Nothing

90 = 6 Sodium Pyrophosphate
Cracked NG -

Following large quantities of following Nickel Baths are to be made to Dup the NiSO4 salts

About 50 Liters of Each salt

Acetate
Trichloroacetate
Bromate
Bromide
Chloride
Fluosilicate
Fluoborate
Formate
Chlorate
Perchlorate

At first on 500 cc is to be made for test cells. ——
The solution should be pure + neutral as possible
No iron or Copper in it,

79 — 6 Ammonium Citrate
Chrome as a cathode + part of 2nd Coat stronly Brittle + Not promising —

101 — 6 Chromic Alum
Black Scaly any deposit NG

82 — 6 gram Carbolic acid
all Cracked NG —

124 6 Manganese Acetate
Bad Cracks Anode get black

125 — Mud of NiOH dark deposit
no metal Anode get black
6 grams Manganese Nitrate

100 — 6 Epichlorohydrin — all
Cracked NG —

Note As Ferrous Nitrate deposits on black hydrox on Cathode
We could make active iron by Electrolysis for Storage Battery in place of the present expensive process - S S S

Ford

118 Magnesium Acetate 6 gr
Perfect - not burned up or Cracked - Tough. bends right angles film flat, Matte White surface fine - Dup & Vary
Calliper 1.1 /cm
Liquid flocky Sediment at bottom

122 6 grms Magnesium Nitrate
Sol Clear no metal dark
VERY Adherent $Ni(OH)_2$ but dark, even hard to scrape off with Knife + quite thick -
Anode clean -

121 6 grm Magnesium Chloride
anode clean Sol Clear
all Cracked -

147 - 6 grm Cadmium Acetate
anode clean Sol slight flocks, loose
Not of Cadmium a thin film
Cd on Cathode NG

from 132 boy made mistake + got too much 6/4 fred dil clean oozy but poly bad

~~117~~
~~132~~
~~127~~
142
133
~~116~~

Should be deleted

for

132 6 gms Manganese Sulphate
Anode got black deposit, cracked
Edge turned up, film hard get
off - brittle NG

127 6 Manganese Chloride
Anode clean, Dol clean
film cracked, brittle hard get
off - NG

142 - 6 gms Lithia formate
Dol clear Anode very clear
Not cracked strips hard
tho good clear Dep

133 - Lithium Acetate -
Dol clean Anode clean
Not cracked but Cant strip

140 6 Lithium Nitrate -
Thin Coat dark - No 0 1/2

End of Book 2

[ITEMS(S) FOUND IN BOOK]

1.40
60

100 Mil amp for 10 minutes
on 2" - if perforated it could
be 1 full inch -
6" inches would give 100 mil
amp for 1 hour.
60 inches 1 ampere hour

Wanted 150 amp for
or 50 discharges of 150 p
adapters each requiring
15 seconds - or 150 amp
for 12 minutes -
or 30 amp hours capacity
1800 inches will give the
capacity, discharge rate would
be 300 Ma -
50 plates 6 X 6 -

[ITEMS(S) FOUND IN BOOK]

If get 20 minutes, only
50 plates necessary

Notebook Series -- Notebooks by Edison
Notebook, N-19-08-26

This notebook is a continuation of N-19-06-18. It was used by Edison during the period August-September 1919. Included are descriptions of numbered electrolytic and chemical preparations, some marked "Ford" if they appeared promising for use in starter batteries for Ford automobiles. There is also a crossed-out list of projects entitled "Experiments to be carried out," with notations regarding projects to be assigned to specific laboratory employees, along with others to be performed by Edison. The list begins with "copper oxide plate" and "Ford starter battery" but includes experiments with electromotographs, audions, and "XYZ devices," as well as electroplating, ore separation, sound recording, and chemical reclamation experiments. The list is transcribed and amended in N-19-09-09. Some of the experiments pertain to Lalande-type primary batteries and to preventing the shrinkage of copper oxide plates. Others involve solutions saved from nickel plating experiments. In addition, there is a list of "chemicals in the dumpy bottles in showcase." The entries in this book reveal the convergence of Edison's work on battery and disc record manufacture in terms of electroplating. The notes indicate that Edison's brother-in-law John V. Miller assisted in some instances. The front cover is labeled "General Book Experiments No 3 Typed." A notation on the flyleaf states that the entries in this notebook were "all entered by typewriter." The pages are unnumbered. Approximately 100 pages have been used.

All Entered by Typewriter

Aug 26 1919

~~180 — Peeled NG~~

136 Lithium Citrate
Sol clear anode clean
Not peeled one edge shows
slight raise White Matte.
lays nearly flat colour stripped
off VERY Tough

142 6. Lithium formate
Sol clear anode clean
Self. peeled in liquid
probably KCl mens - Springy &
TOUGH

160 6 Cobalt Chloride
sol dark anode black
deposit - Cathode
stripped easily NG

133 6- Lithium Acetate
Sol cloudy anode clear
Stripped Easily + part
replated Springy to Cork screw
TOUGH.

#11 = 6 Nickel Silicofluoride - ??
Sol, clear anode clear
All split longitudinally
NG,

146 6 Lithium Sulfite
Sol clear anode clear
all split up NG

94- All split Longitudinally
6 Antipyrine -
NG
Sol clear anode brown
deposit,

80 6 Metadinitrobenzol
sol clear anode clean
Black streaky dont again
Get any nickel deposited
NG! —

271 or 291 - 6 Calcium Chlorate
sol clear anode clean
All split brittle, 5 5
1 1

163 - 5 6 Cobalt Bromide
sol clear anode clean
Split bad along lines
of record & even on smooth
part same curve Tough.
But NG

141 6 Lithium Fluosilicate
Split off probably 30
min NG Very Brittle
sol clear anode clean

274 Magnesium Citrate
Sol clear anode clear
Perfect not peeled on
split bright matte
Comes off flat VERY Tough

95 - 6 Benzyl alcohol
Sol clear anode clear
Curious reddish deposit
of brittle metal fuming red smoke
NG

97 6 Butyl alcohol
Sol clear anode clear
All peeled early Very
Brittle NG

252 6 Zinc acetate
Sol clear anode stained slightly brown
Very thin deposit, dark
+so brittle breaks up to chips
1/32 by scraping with
knife — NG

129 - 6 Uranyl Acetate Fluoride

Brittle, peeled pretty
40 min / NG
sol clear anode clean

210 ? Sodium Rosalate, - grayed
sol cloudy anode stained Red
Horrible brittle film,
dropped off easily / has red
shrunken like 95 NG

216 - 6 Sodium Perrophenate
sol clear anode clean
Very brittle peeled pretty
20 min - red color NG

269 6 Cobalt Citrate -
Sol clear anode clean
Perfect, perfect edges all
over + flat but when dropped it curled
up to a tube VERY Tough
it gassed

173 6 Ammonium Bromide
neidal
Turned up a little at one
Edge has peculiar glistening
dots on outer surface
peels + lays flat Its Grithe
about same as regular -
Sol clear anode clean

#2 fe ferrum sulphate

peeled about 45 mm
Whole 1 ep 1/2" turned up
also little of bottom
Comes off flat flattest yet
but its very thin plating
probably 1/2 that it is a chance
be a little brittle -
Sol clear anode clean

93. E-Sodium Salicylate.

Both Edges turned up
Semi brittle not prominent

178. Ammonium Sulfate
neutralized
One edge turned up
has bright specs pearly
nearly flat Matte slightly
brittle NG

171 ? 6 Ammonium Benzoate
Solution anode cotton
Broken, Extraordinarily
brittle, NG

→ Ford

→ Ford

→ Ford

102 - 6) Aluminum Bromide
Neutralized. Solder anode clean
.020 green hydroxide ppt
very adherent for Ford
blackish

103 - Aluminum Chloride ?
Can't make neutral
Green hydroxide but
greenish + not so good
as 102 clots + some came
off in the bath Eventually
~~[illegible]~~
~~[illegible]~~

253 ? Zinc Bromide - ?

Very dark very adherent
but there are places where
pieces have flaked off

→ Ford

→ Ford

165 - 6 Cobalt Nitrate
Sol dark anode clear
perfect even deposit
black & probably .020
thick cudgs good, porous
fine for Ford

259 - 6 K Permanganate
Sol dark anode stained violet.
Then coating of
reddish most has fallen
off — it might cling to
Ni without 8/4 Ivy

262 6 Sodium Bichromate
Sol clear anode clear
Nothing on it at all

→ 7ond

or Nitrate

264 6 Sodium Nitrite
Sol cloudy anode clear
Very fine deposit about
020 very tenacious Black
nothing comes off to
darken the finger
GOOD — 2 chipped
of pieces near top —

17 = 6 Cadmium Sulfate
Part metallic Ni —
overthal or black Ni
sol clear Anode clear NG

152 - 6 Cadmium Fluoride
Very thin deposit of
black NG
Sol cloudy anode clear

151 6 Cadmium Chloride
sol clear anode clear
Very thin deposit
black Cant say if any
metal

255 or 234 6 Zinc chloride
Sol cloudy anode clear
dark deposit very
thin may be some metal
look at up

256 — 6 Zinc Nitrate
very thin ~~[illegible]~~ 2
ng
Sol clear anode clear

170 6 Ammonium acetate
sol clear anode clear
peeled early in the hour
very brittle.

111 — 6 Lithium Bonate
neutral. Sol clear anode
has black deposit on part
of it. Peeled early, Cracked
very brittle.

Good →

Good

Tried this but green comes off & underneath is a black deposit — probably Ng —

Good

→

3 = 6 Chromous sulphate
Sol dark anode clean
Black film say 005 thick
on Cathode

25 6 Sodium Meta Phosphate
Sol clear Anode clean
part metal & part Hydroxide

258 — 6 Zinc Salicylate
Sol dark froth on top —
anode tinted yellow
Cathode Thin green hydrox
Ni deposit,

137 — 6 Lithium Tartrate
Sol clear Anode clean
one corner raised white
matte perfect deposit.
says nearly flat.
Tough

Phenomen

134 — 6 — Lithium Benzoate
Not peeled. White matte
after coming off flat —
TOUGH,

260 — 6 — Na Hypochlorite
anode clean Sol clear
all curled up. brittle

113 — 6 — Silicofluoride of Ni?
or what, Sol clear
anode clean — bad deposit
around Edges, thin — tough
Not promising

221 — 6 — Mannite,
Anode clean — Sol clear
Bad Edges ~~Became~~ brittle

177 — 6 — Ammonia Oxalate
neutral — Sol little cloudy
Anode clean — 4 Edges curled
up — about 45 min before turning
2 green — film flat no spring Very brittle

Note →
deposit between
Solar K Citrate

272 6 – Potash Citrate
Anode clean Sol Clear
Peeled Easily – Tough –
White Matte –

Tried plating # 122
Magnesium Nitrate put on 1"
1/32 hole nickel grid, it flakes
off at 100 ma density –

117 – 3 grms Hydroquinone
Solution clear except floating
Crystals, spangles
Anode clean
Nickel wont crackup yet

261 – 10 cc Saturated
Bromine water
Anode clean Sol clear
Ni little Cracked all along
Edges. About as bright as
Reg White matte lays flat
flat – Varnish wrinkled
by the Bromine + made
white but still OK –

→ Ford

276 – 4 grms Nickelous Citrate alone. no sulfate
Very high resistance decomposition
Anode tinted dark
Cathode covered at edges with $Ni(OH)_2$ but other part flaked off

110 – 6 grms Borax neutral not affected
Anode brown thin deposit
Cathode Ni all cracked up all over

267 – 6 grms Sodium Tungstate.
Anode clean Sol clear
Ni all cracked up

125 – 2 grms Manganese Benzoate
Sol full float stuff –
Anode dark red some deposit
dropped 45 mins curled up
then deposit started brittle as
Rey – V

Experiments to be carried out
Aug 27 1919

Copper oxide plate – Hart & reg mo
Ford & Clarke Gallery. Burns, Hanley, Lott, Elo Kuchler, Eg.
Audion 1 2 & 3 tube cell – Gallery – Edison
~~Regeneration Cu & Ni Carbonate, Dolezalek~~
" " Old cell nickel mix "
Rapid Copper plating – Edison
~~" Nickel " Edison OK~~
Emg + Chalks Hanley – Fredotte
~~Discard Nickel fold Working Mounted~~
~~Seperating Cu from Ni~~
New Blank process, Dally Dwendler
OK ~~Wilfrid returned Auto Co Wm~~
Automatic Vacuum Seal, Experimental
Long tunnel Experiments recording, Exp to Hill
Sand powder in flake plating.
& improvements to Chelapen
Hard rubber battery parts –
Lithium process. Edison
XYZ devices –
Seperating Ni & Cu from Sudbury ore
using Zinc & SO4 Methods Water power
H_2SO_4 Chamber A from Young Sulfur
8/4 drawing Mfg sheet No 0001 to 004
for sale Aluminum specimens.

→ Good

Note →

108 - 6 grms Sodium alum
Sol very slightly cloudy
Anode clean
Cathode has dark Ni all
Cracked + some hydroxide.

294 - 6 grm K Oxalate
precipt Ni anode clean
Brittle ~~upcoat~~ Cracked along Edges

99 - 5 Monochlorohydrin
Anode clean Sol nearly clear
Ni all Cracked bad

87 - 6 grms Ni Acetate.
Anode clean Sol has some
precip -
Cathode plating Perfect
no cracking peeling or
turning up at Edges
TOUGH don't break at
right angles - may be the
precip plated in does it
flat

295 – 6 grms Oxalate
bad precip – Anode clean
& all cracked & peeled
yet big precip –

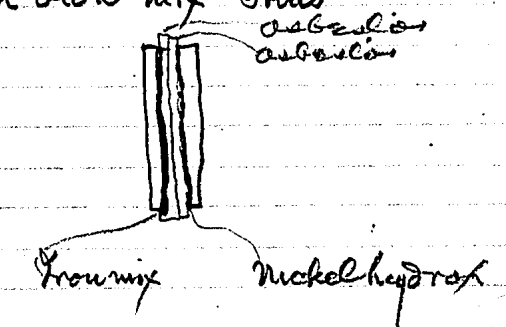
255 – 6 grms Anilin Oxalate
Sol fairly clean Anode
yet black – No dark scraper
off as a powder with
Knife – Anode black
rub off Easy –

Note Try Citrate Nickel
6 grms – it might work
better than acetate Ni see
#87

Note →

Aug 27 1919

It is likely that plain or perforated sheets say 5 X 6 can be covered with a thin sheet of asbestos over which has been spread a mush of finer than 200 mesh Ni(OH)2 reg moistened with a little NaOH. The same with 200 mesh iron mix. Thus



by placing say 15 Ni plates & 16 iron plates together with a thick plate on outer sides & bolted together that a ford started can be made successful. The thing to be ascertained is the gassing & stability of the asbestos

perhaps japan paper or coarse weave cloth can be dipped in the Varnish we use which is not attacked by alkali - This would act to hold the Fe + Ni mix against the plates + possibly be more stable than Asbestos

Perforated Mica might be used possibly.

Glass cloth, (Lime glass) could be used

Ford

153 — 6 grms Cadmium Formate
Anode Clean Sol clear
Apparently Cd Mud deposit
no ni some mud in bottom
of Cell, Could recover
Cd from such solutions this
way —

263 6 Sodium Iodate
Anode dark Sol cloudy
dark, scarcely any deposit
part metal part mud
very thin perhaps .002

123 4 grms Magnesium Formate
Sol clear. Anode yellow
tinge Fair deposit,
one edge for $1\frac{1}{2}$ inch turned up
but no Corners about 6 inches
as Regular. ~~Cat~~

— Food —

104 6 Aluminum Nitrate
Sol faint cloudy
Anode clean Cathode
Thin 002 probably black
Very adherent hydroxide

24 6 grms Ferric Sulphate
Sol Clear Anode clean
Anode dull some bright
all cracked NG

119 – 6 grms Magnesium Bromide
Sol clear Anode bright
Cathode all cracked up
NG

265 – 6 grms Sodium Perborate
Cloudy + a little sediment at
bottom jar Anode clean
Cathode Ni split badly
NG —

Ford —

Note —

143 – 6 grms Lithium Hydrate
Anode Black very thin &
awfully adhesive
Nickel all split & peeled
NG

296 6 grms Potash Acetate
Anode little dark Sol Clear
Ni turned up 1 edge, brittle
about same as Reg —
Has darkish tinge,

297 – 6 grms Sodium Acetate
Anode clean Sol Clear
Plating Perfect
~~Flatest deposit~~ yet

bends right angles without
cracking

Note diff between
Potash & Soda
Acetate

246 – 112 grammes
Nickelous Bromide
not saturated
Sol Clear Anode Clean
Nickel all horribly
Cracked & peeled & Color
of 8/4 – NG

209 – 6 grms Resorcin
Sol clear, Brownish red
deposit very thin on
Anode. Ni cracked at
Edges all around NG

148 – 6 grm Cadmium Nitrate.
Sol Clear Anode clean –
good tenacious deposit on
Cathode .005 or heavier.
Black

Grid →

59- 3 grms Cinchonine
Anode clean Sol Clear
No deposit, dark tinge

145- 4 grms Lithium Sulfite
Anode clean Sol Clear
Cracked along Edge,
lifted, White matte
Very Tough bends twice sharp

301- 6 grms Manganese Acetate
Sol cloudy Anode black
deposit jet black
Nickel Cracked all along
Edges, brittle as Rag

295- 6 grms Aluminum Acetate
Anode clean Sediment in
Cell & cloudy Nickel
badly Cracked NG

247- Saturated Sol
of Nickel Chloride
Sol Clear Anode lifted
All cracked + peeled has color
of 8/4 NG

12 grms to Beat,

302 6 grms Stannous Acetate
Clear Sol Anode Clean
Nickel peeled early - 2
Coats, brittle like Rag

248 — Nickel fluoride not
saturated & had to put
large quantity Ammonia
in to neutralize
Sol clear Anode black (jet)
think deposit Nim —
Ni all peeled, + Cracked
not brittle,

Dup of 77 - 12 grms Citrate Soda
Sol Clear, OK perfect nearly flat bends
flat at corner no break, springy, bent 3 times OK
broke 4th
77 — 8 grms - Same as 12 gr
bend sharp at corner Twice broke 3rd
flat + rebent like 12 OK perfect.
77 - 4 grms. broke on 1st bend
flat, springy, OK perfect
77 - 2 grms turned up one edge
bends OK two ice, springy, + will allowance
like 12 grm

Note →

77 — 16 grams clear Sol
One 2 days turned up
More spongy than the others
seems to be thicker,
bends 3 times

The range is 4 to 8 grams
probably 6 grams per
250 cc of Ni SO4 nearly
saturated,
Now the question arises as to the
Citrate attacked or destroyed
or changed, or is solution once
made permanent Only way
is to keep stealing out Ni or
after a solution put in a 8/4
test plate

55 — Duplicate 2 grms
Ammonium Alum Sol clear
Anode clean — Ni terrably
Cracked NG

Summary Alum
Mg

55 Dup 4 grams, Sol clear
Anode dark spots, badly
Cracked Ni not so bad as 2. gr

55-Dup 8 grms. Sol clear
anode clean badly cracked
Nickel

55 Dup 12 grms, anode clean
Sol clear cracked Copper peeled
off - red Color - Very thin
plating

55 Dup 16 grms. peeled up like
12 gr

55-Dup 2 grms, some metal +
some green hydrox

There was some mix up in
Original # 55 to have got
such good results. What?

~~Backup~~

Dup 248 — 6 grms Nickel Silicofluoride
Anode clean Sol clear
breaks on 1st sharp bend, has
fine warts on, it peeled up slightly
at 2 Corners Not pronounced
but Variations nearly reaches it
OK — I suspect Silicofluoric
acid was got from Cooper as
impurer — pbly has Sulphuric
acid in or Copper Etc

Dup 248 — 18 Grams
Silicofluoride Nickel
Anode bright Sol cloudy
Nearly breaks 1st sharp turn
full fine rough spots with
black streaks running up
from them not pronounced

300 - 1½ grams Cobalt
acetate Sol dark
Anode Clean Ni perfect
Sharp bend 6 times
has sharp fine specs on it
not many warts —
Very good

Sulfate Alumina
NG

Dep of #1 4 grams Sulfate
of Alumina — Sol Clear
Anode Clean
All Cracked up - NG

Dep 248 — 36 grams Silicofluoride Ni
Sol Clear Anode Clean
Ni Turned up very slight at
1 corner broke 2nd sharp turn
full black sharp plate

131 - 6 grms Manganese Formate
Sol Clear Anode Clean
Curled up, Split, broke
1st Sharp turn.

Dep 8 grms Sulfate Alumina
Anode Clean Sol Cloudy
Ni cracked NG

Ford-Kolo-

Possibly with $Ni.SO_4$ sol + 6 $NaNO_3$ I could saturate this sol with Either Saturation by $NaNO_3$ or some other sol salt, make it Cathode, after covering removed from sol dry slowly + after say 10 hours + 220 temp percolate out the salts + Thus make $Ni(OH)_2$ hard + Very porous, too dense now

Possibly I can use spongy Ni by H + make it Anode in a sulfate sol containing ~~[illegible]~~ ~~[illegible]~~ + electrolyze Reverse + precip the $NiSO_4$ in situ + do this till only net work of metal sponge left to conduct.

Possibly Ferric or ous Sulfate will do this deposits with $Ni(OH)$ after drying Fe_2O_3 be precipitated with the $Ni(OH)_2$ locking it together like a plot tube,

For Cu Expts up to now

$Ni.SO_4$ - 4 grms Tartrate Polish sol Clear Anode clean peeled auto, brittle -

$NiSO_4$ — 2 grams Tartrate K sol Clear Anode Clean one Edge turned up - flat, broke 2nd bend

Dup - #6 — 8 grms Manganic Sulfate Anode on plated dark - Whole top loose - broke one bend -

Dup 6 — 4 grms Manganic SO_4 Anode + sol Clear one Corner turned up broke 1st bend -

Dup 6 - 2 grms $MnSO_4$ in Anode sol Clear one corner just lifted broke 2nd bend

Manganese Sulfate
ng

K Tartrate
ng

Dup of #6 - 16 grms $MnSO_4$ is
dark black
slightly cloudy
No peeled + Cracked along
Edges ng

ditto 12 grms No Cracked
+ peeled not so black as
16 grms

Dup 272 - 2 grms Citrate Potash
both + Nodf clear
one Edge turned up
broke 1st sharp bend

Dup 303 - 8 grms K Tartrate
both clear No all
Cracked + peeled

ditto 6 grms all peeled +
Cracked

ditto 12 grms all peeled
+ Cracked

Ford

Note. If I make a nearly saturated sol of $Ni(NO_3)$ it deposits a dark hydrox of Ni very very slowly. If I use a 2% solution it deposits quickly a fine transparent green & very quickly. Strong sols of nitrate are thus found bad while weak ones are good

I notice that with weak $NiNO_3$ Ni cathode dipped in $NiNO_3$ to clean & then washed that the green sticks tenaciously to smooth part above the holes but flakes away at holes. Perhaps .005 plates many & thin coat put on very slow say 20 Ml amp per 1" both sides will serve if made matte by acid dips —

If I can get rid this way all that would be necessary is sheet paper or asbestos between each Fe & Ni plate. The several plates clamped together by 2 heavy outside plates —

Dup of 118 2 grms Magnesia Acetate - Anode darkened Sol Clean Plating perfect Curled a little make 1 bend OK, broke a little on 2nd bend - OK Matte

Dup 272 Anode + Sol Clean 4 grms Potash Citrate one Edge lifted Curled up to roll broke 2nd bend

Dup 118 5 grms Magnesia Acetate Anode slightly dark - Sol Clean 1 corner lifted very slightly broke 2nd bend

Dup 118 - 8 grms Magnesia Acetate Anode darkish Sol Clean plating Perfect Matte lamp nearly flat broke 3rd bend OK

Dup 272. 8 grms Potash acetate, Anode clean Sol Cloudy Ni peeled —

Dup 118 — 16 grms Magnesium Acetate Anode dark in spots Ni plating OK — sharp corners on it broke 3rd Bend —

Dup 78 — 2 grms Sodium Tartrate Sol clear Anode clean Ni Plating perfect, broke 3rd Bend dont Cent flat Matte —

Dup 78 — 8 grms Na Tartrate Anode & Sol clear 1 corner turned up. broke 2nd Bend

Dep 118 12 grms Mg Acetate
Anode black Sol clear
Plating perfect
Clings very light to Cathode
Spongy broke 2nd

Dep 78 ~~Dep~~ 4 grms
Sodium Tartrate,
Anode & Sol Clear
One Corner turned up
broke 1st & 2nd only Curl
a little

Dep 78 – 16 grms Sodium Tartrate
Anode & Sol clear
Plating Perfect broke
first 6th curls only
slightly – Think 1 corner
was slightly raised Walter

Dup 78 – 12 grms Na Tartrate
Anode + sol Clear
Plating Perfect
Very slight crack at one corner
with only little sparingly
broke 2nd & a little on
1st.

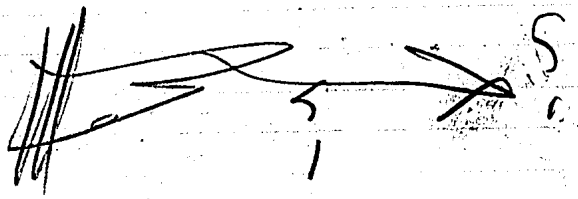
181 6 gr Santonin, Anode + sol
Clear. Corner up, broke 1st time
not sparingly little

233. 6 grms Hippurate Soda
Anode covered with some kind
of Crystals. Plating perfect
broke 1st time flat spots on it
Sol has ppt cap – too much
of the Hippurate. Test with lac

184. 6 gr Sodium Succinate
Sol Clear Anode Clear
Bottle – peeled Easily

227 – 6 Beta Naphtol Anode
Clear Sol Cloudy + precip
Not all Cracked

Dup.



49 – 6 grms Benzidine Sulfate
Sol clear Anode clear
The Worst cracked Cathode
Yet –

10 Dup 2 grms Boric acid
Anode & Sol clear
found it peeled full length
about 50 Min – Makes
3 bends before brkg – Curled
up nearly Orange Matte

180 – 6 grms Salol Anode
Sol clear Ni plating
perfect Bends 6 times
before cracking – Comes off
nearly flat, Matte

187 – 6 grms Sulphonal
Anode & Sol Clear
Plating perfect
Bends break 7th
Matte & slightly dark

I note that when an edge is turned up or whole film peels it is always at the TOP (not always) Will not have this to contend with in plating discs —

204 — pyrogallic acid Sol dead black anode black. all cracked NG

214 6 gm Sodium Alcoholate Nearly undissolved at say, but Sol clear anode dark spot Edge turned up — broke 2nd bend —

See 5 pages further on

Try Butyric acid Soda Salt
Ni Salt; Mg Salt.
also Aconitic + Itaconic acid Na Salts.
Acetamide Acetanilide
Acetone, Methacetin,

Sept 2 1919

Note Velande CuO plates
Experts

To diminish shrinkage of present plate, without changing process powder too much fine, firebrick —

# 1	add	5%
2		7
3		10
4		15
5		20%

Bake these regular way they do now, moisten with ~~[illegible]~~ soda as usual.

If plates are baked reg, they can be repowdered made soft + these will not shrink

If the Metal Copper ~~[illegible]~~ turned into CuO + baked higher + longer like plates then when made into plates will probably not shrink If this powder has been up to plate baking

Friends — $CuSO_4$ 10%
best under yett at
1300 @ 1350 less Blue
Comes out $FeSO_4$ next
1300 @ 1350 —

temperature its probable that
no BLUE will come out in
NaOH
Experiment — Powder up
Reg baked plates crush
thru 180 mesh & try Sulphur
Lime glass Etc $FeSO_4$ dry etc & see if Blue
Comes out,

Experiment, Put some of powder
Red from Silver Y with
which we have been using
put in NaOH & see if Blue
Comes out, —

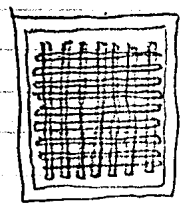
Try look together ~~off~~ new reg
plates repowdered with
Sulphate of Copper Iron
Lime Barium Strontia
Etc — + Alumina, SO_3 well
decomp + leaves the oxides

If the CuO can be test high temp
so it gives no Blue like a
Reg plate, it also will
be ok is after several Days
warm in NaOH to Strong Enough

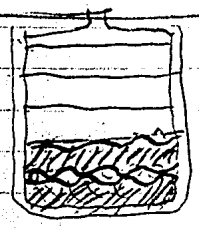
The main thing seems to be to stop the Blue in the NaOH. High temp does it in plate. Can't be made so before it goes into plate by long baking & higher temp like the plate,

Try Infusorial Earth, Fuller's Earth, Electro silicon — Kieselguhr. These will form Cub. Hydrate,

How about Corrugating Rag plate



has anybody patented this — or Holes in plate



Several plates — Eplet

Acetate Mg.
16 grms too much
12 grms perfect.
Range is from 2 grms.
to 12 for 2 hours
probably 5 is OK

probably best

Continued from 3 rollen pages back

Dup 77 Same liquid
6 grms Citrate Sodium PERFECT
bends twice 2 Hours plating
malte.

118-16 grms Magnesia Acetate
one edge turned up but near end
of run broke 3rd. 2 Hours plating
malte

118- 2 grms Dup 2 Hours
plating Magnesia Acetate
Plated PERFECT.
flat, bent 8 times malte

77 Dup 8 grms Citrate Soda
2 Hours plating bends
5 times, Malte PERFECT

118-Dup 4 grms Acetate
Magnesia PERFECT
broke 10 times, Malte 2 Hours

Callipering as nearest possible
Error of Callipers .500 based pin

118 =	2 grms	1.600	smooth part
		2.300	Record
	4 grms	1.800	Smooth
		2.100	Record
	6 grms	1.900	Smooth
		2.000	Record
	12 grms	1.900	Smooth
		2.000	Record
	16 grms	1.900	Smooth
		2.300	Record

100 ma per inch gives .900 thickness of Ni with Acetate Magnesia

118 Dup 12 grms Acetate Magnesia broke 4th bend Metal,

Lelande —

Broke off piece of ~~[illegible]~~ plate, ready for sharpening from Lehr, in 15 hours in tumbler on wood over hot plate I found the Metal was Light Blue showing it comes out.

Now 10.20 am – 3rd Sept. Light blue Evidently all our Cells give blue when Eats up Zinc SL Reg Very Little Compared to our Silicates, S + other Experts —

Dup 77 - 2 grms Citrate Soda
Sol & anode clean
3 HOURS - Perfect flat,
bright matte, broke 15th bend -

Dup 118 - 6 grms Acetate Magnesia
Anode clean slight sediment
bottom of jar - Perfect —
flat, dull matte broke 4th
bend 3 HOURS.

Dup 77 - 12 grms Citrate Soda
Anode darkish, Sol clear
Ni Cracked at Bottom
peeled up 3 HOURS

Dup 118 - 8 grms Acetate Mg
Anode & Sol clear
Ni Perfect 3 HOURS -
Light matte broke 7th bend
There was lots of froth on
this cell for some reason
none on others -

Dup 77 16 grm. Citrate Soda
Anode or Sol Clean
3 HOURS. Nearly flat
bright matte, broke 5th -
More springy than less
Citrate.

Dup 77 4 grms. Citrate Soda
Anode or Sol Clean
3 Hours — Perfect
slightly dull matte
broke 8th Bend -

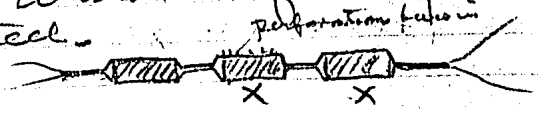
I notice all the Group of
Acetates of Nickel are
frothing on top from gas
My theory that according to
Catalytic action of the Ni
metal the acetic takes on
hydrogen in its molecule
& thus prevents the Nickel
from absorbing it is the
reason why the Ni is not
brittle & tends to curl.

The Chemical the result of
Acetic acid taking on H
may be a Soap like chemical
which account for the froth,
The froth thing didn't appear
on Acetates of Magnesium
group except one cell.
The Citrates act the same
way absorbing Hydrogen
Its probable all of the
Acetic series except formic
will act as absorbers of
Hydrogen

Perhaps can use an
Electrolyte like Nickel,
+ add Acetate of Mg
or an Oleate sol in the
liquid + transform the
Oleate to Stearic etc —
This would be a new council
process for raising the
fatty acids higher by
means of Electrolysis

2nd Sept 1919

Ford – Proposition now is to perforate in strips 3/8 wide – the whole sheet of .005 Ni plated steel –



5" wide 6" deep

May the Ni(OH)2 with small amount of NaOH & squeeze it in ribbons by a die & hydraulic press, cut in proper lengths & dry – these are hard in pkts one plate only. The other plate is put on & run in hydraulic press. The two are then together & while in position the 2 plates are riveted or secured or spot welded together along the non perforated parts between the perf'd pkts –

possibly lies be better

The Coulombic pocket being all in one sheet it is likely burs can be ground down considerably to get better density rods without danger

Commercial for factory Mfg Copper Ni Zn Silver Gold & other plating Metals in sheets from Copper Cathodes .001 up to .010 –

New Plating Salts Hydrogen absorber like decitals Citrate etc for Nickel Plating: malleable non brittle springy.

8/4 for stripping plated metals from Anodes,

Forming Hydroxides by using Nitrate of the metal wanted & forming Hydroxide on Cathodes Separating off Coulomically = Water power,

All Acetates Ni in
Ni.504 froth at
top of Sol

Dup 87 – 12 grms Nickel Acetate
Anode tinted Redish. frothy top
Liquid Clear Plating Perfect
flat, Matte but not white –
broke 3rd Gen 4 HOURS
PERFECT

Dup 87 – 16 grms Nickel Acetate
Anode slight brown Sol clear
frothy top – Ni Perfect – 4 HOURS
flat. matte, dull. broke 3rd Gen
PERFECT

Dup 87 6 grms Acetate Nickel
Anode + Sol clear. frothy top
flat, Matte dull – broke 4th Gen
4 HOURS PERFECT

Dup 87 8 grms Nickel Acetate
frothy top + Anode + Sol OK
flat, dull matte. broke 10th lines
4 HOURS PERFECT

Dup 87 – 2 grms Nickel Acetate
Anode + Sol OK – 4 HOURS
Comes off Dead flat broke
8th Gen Perfect 10 lines broke
Dull matte.

Think 4 to 6 grms best
This has enormous range
but do not like the
froth. Bad Anode Efficiency
I guess, perhaps McAdale
better, it has no froth &
was nearly neutral
when 2 Cathodes were
plated out -

2.29 grms

Dup 87 - 4 grms Nickel Acetate
made tinted light red 4 Hours
Dead flat PERFECT
dull matte - broke 10th bend

I find all of the Dup of
87 - quite acid This was
not tried with Acetate of
Magnesia

---

87 - Acetate Ni being used
I tried make it neutral by
adding $Ni(OH)_2$ it seems to
have no effect although
8 grms has been on left
after steam coming off
for last 3/4 hour -

No 1 - Dup 12 grms Dul Sulphate
Alumina - 2 Hours 29
Ni Anode & Sal Chem
All cracked & peeled

Dup of 10 – Anode blood red
rubs off – Sol Cloudy
Nickel bad at bottom
Dropped at 12p NG –
4 grams Boric acid
on 2 hours 25 minutes

Dup 10 – 16 grms Boric acid
Anode brownish Sol Clear
N Dropped but good –
Bright. Curled up broke
2nd bend seems thick
on 2 Hours 25 min – it
wont stand more than
2 hours –

Dup 1 Sulfate, Alum –
16 grms NG

Dup 10 2 grms Boric acid
Anode black, Sol clear
Cracked all along all
Edges NG 2 Hours
25 min –

The CuO Leclanche disc
8% of Slake dried sulphate
baked 1250° fahr & soaked in
Water, (This stood 20 1ft drops
& 1 3ft drop) then put in
NaOH for a week then Emplaced
& put in fresh NaOH 20%
showed ~~very little more~~ same
blushing Titan Reg 62 plate
blushing after 15 hours,
28 Hours Reg & 15 hours
iron plate about equal
blushing —

Iron will do the Bz
I think

Temp of Solutions is
134° fahr

Dup 10 — 8 grms Boric Acid
Solution Anode clean
Ni Perfect 2 Hours 25 Min
broke 4th Bend — Not much
Malle —

Things to be tried in plating
Nickel

6= Acetate Ammonia
" Anilin
" Of all the Organic bases in dumpy
like Diphenylamin, Amidophenol,
Paraphenylenediamine
Acetate Quinine
Try the two Ketones brought by Simpson
A. Glucose,
Acetylene gas
Acetal
Propionate of Magnesia
" Soda
" Nickel
Butyrate of Magnesia
" Soda
" Nickel

Each of the chemicals in the dumpy bottles in Show Case

Trichloroacetate of Magnesia
" Soda
" Nickel

Acetanilid -
Acetamide
Anisidin
Acetone
Aconitic acid Mg Salt
" Ni "
Na "
Adipic acid Mg Ni + Na Salt
Benzoic " Mg Ni + Na Salt
Amidobenzoic acid " "
Arachidic acid " "
Caproic " " "
Caprylic " " "
Carbolic " " "
Fumaric " " "
Glyceric " " "
Glycolic " " "
Hippuric " " "
Lactic " " "
Maconic " " "
Levulenic " " "

Malic acid / Na Mg Ni Salts
Monobromoacetic " " "
Monochloroacetic acid " " "
phenylacetic " " "
Phthalic " " " "
Quinic " " " "
Salicylous " " "
Terephthalic " " "
Ortho-Toluic " " "
Para " " " "
Meta " " " "
Tropic acid " " "
Valerianic acid " " "
Sodium Methylate ~~" " "~~

Note, !!! I put a Zinc in 20% sol. + then added 30 to 40 grams acetate soda, used a Nickel Strip, This gives with 50 ma a Voltage of ~~[illegible]~~ 3 tenths of a Volt for 10 minutes + then diminished after being on all night + 12 hours it was .29 Volt or 38 ma — The idea is that the Hydrogen is taken care of by absorption of H by the acetic Radicle — Sol clear

Note = for separators in Storage battery — Iron wire dipped in melted mix of paraformaldehyde solution, also some filled with short fibre Cotton, also, Cotton — Limestone powder or Ba SO4 — or without Cotton but just Cinnamon — Limestone,
Wire should be peroxidized on surface a bit up to red —
Possibly just wire alone
Could be used being sulphurized but then that up to full yellow or go to Coat with layer of Fe_2O_3 anhyd

Or a very sensitive acetate or Citric Compound is used + a large surface of spongy Nickel the Voltage by Catalysis of the acid will absorb H strongly + give very much higher Voltage possibly it could reach or Exceed Copper Ox. Voltage + be substituted for CuO in Leclanche battery —

~~200~~ 100 ma per inch
45 = 6 grms Paraphenylendiamin Sulfate Sol dark not clear
Anode ok positively
the worst yet, Cracks see over nits 010 leaflets
Might be possible to make Ni flakelets way — J. Hoerlein

185 – 4 1/2 grms Sodium
Sulphoantimonate –
Sol dark Anode clean
4 hours Cracked all
along Edge – Thin

193 – 4 1/2 grm Sodium
Trichloroacetate. Sol
Clear Anode Ok
Cant get it off – quite thin –
Sticks absolutely –
Very bright slightly Matte –
Its quite sticking & would
be useful where sticking
to the other metal is
desirable
The grain of the Ni is
Excessively fine –

Note – F. Miller made some
Mixed oxides of Fe + Mg
by igniting $FeSO_4$ + $MgSO_4$
75 $FeSO_4$ + 25 $MgSO_4$
5 grms reduced by 1 quart
1200 MA Hours

I now am trying to dissolve
out the MgO by weak
Sulfuric to make the
Fe_2O_3 more porous
to last in Cell —
in 10 min. Sol gives $Mg(OH)_2$
by Ammonia scarcely any
Fe —

217 6 grms Sodium Maleate
1 Hour. Sol + Anode OK
Matte darkish Perfect Shaly
But after stripping off Mat
the slightest bend it breaks
to as brittle as glass —.
I crumpled it in fingers
to flake – but is good,
This might be useful
Phenomenon !!

215 – 6 grms Sodium Linoleate
Sol clear Anode reddish
Badly Cracked + peeled
NG

155 6 gr Cadmium Sulphate
Sol Clear Anode Copper
Color Cadmium Sponge
on Cathode NG

138—6 - Lithium Bromide.
Anode + sol clear
Cracked around Edges -

6b. 6 grm Naphthylamine Sulphate
Sol Cloudy. Anode Copper
Color. NG - no plating

228 - 6 grm Sodium Oleate
Sol + anode clear
Perfect plating bright
Very brittle wont turn
right angle break at all -

313 6 grm Parachloroaniline
Sol slightly Cloudy Anode
Brown All peeled +
Cracked

306 - 1 grm Tetra ethyldiamido
diphenyl. Anode + sol OK
Very slight deposit clear ni NG

179 - 6 gr Antimony Potassium Tartrate
Sol cloudy Anode clear
All cracked NG

Note Ptes

Acetate Mg Cone
is slightly alkaline
to Litmus paper

NiSO4 6 acetate of Nickel
Cannot be made neutral
Cold with dried $Ni(OH)_2$
from battery Co Even if
fine thru 180 mesh &
stirred when at ordinary
temperature but if recent
precipitated NiOH boiled for
1/2 hour to bleached free
of Cl Acid it becomes
neutral in a few minutes
Cold (when vigorously
stirred Solid form
will have to be used
a little heat in bath
probably be good
say 100 - 110 the heat
would go quick

85 - 6 grms Hydroxylamin -
Sulphate Anode clean
Sol Cloudy Cracked awful
NG

299 - 2 grms Cerium Acetate
Sol Cloudy Anode Clean
PERfect gray Matte
broke 4th time two top
Corners very slight recess -
Comes off flat broke 4th

311 - Carbazol ? ? 6 grms
Anode & Sol Clean - Perfect
except two top edges very slightly
turned up - broke 4th time
turns 1/2 Corkscrew sharply
on pulling off - J.
Lunk -

Dup 187 – 8 grms Sulphonal
Sol has precip – Anode off
Edges a little cracked but
pretty good plating – breaks 5th bend
White matte,

Dup 187 – 4 grm. Sulphonal
no sediment Sol cloudy
Edges turned up top + bottom
Very bright matte, broke 4th
bend – edges slightly cracked

Dup 187 – 2 grms Sulfonal
Anode clear Sol ~~bloody~~
broke 8th bend ragged edges,
top + bottom corners turned up.

Dup 180 – 8 grm. Dalof. 3 hours
Sol + anode clean broke 6th
One edge corner slightly turned
up – Pretty good plating
Lead colored matte,

Dep 180 - 4 grms Salol
Sol + Anode Clear 3 Hours
One top 1 bottom 2 edges
turned up 2 edges little faulty
Cracked in spots, fair plating

Dep 180 2 grms Salol 3 Hours
Sol + Anode OK
one edge slightly turned up
This is good plating
broke 5th bend

3 Hours
Dep - 136 - 16 grms Lithia Citrate
Anode very clear little Sol
broke 13th bend - light matte
Plated perfect flat 3 Hours

Dep 274 - 2 grms Citrate Magnesium
Sol + Anode OK bright broke 15th bend
plated perfect flat

Dep 136 8 grms Lithia Citrate -
3 Hours - plated perfect -
15 bends flat

All plating is 100 Mil per inch

136 Dup. Anodes 10 OK —
2 gms Lithia Citrate
Plating perfect, head color
Light matte — 13 times bent,
flat, 3 Hours

Dup 136 — 12 gms Lithia Citrate,
Sol. Anode 10 OK broke 10th
perfect plating 3 Hours
200 ma Perfect plating

Dup 136 — 4 gms Lithia Citrate
broke 20th time — brighter matte
3 Hours plating perfect plating

#33 1 Hour

1 Hour — 75 grms Nickel Ammonium
in 200 cc water, Neutralized by NH4OH
some sediment anode clean
only a blush of bluish Ni -
NG -

1 Hour

312 - 6 grms Thorium, Organic
filtered, anode Sol clean
one corner turned up brilliant Red

1 Hour

238 6 grms Sodium Phthalate
big froth on top. Sol clean
Anode tinted brown
hardly a blush of Nickel

1 Hour

31 — 50 grms Ammonium Chloride
in 250 cc H_2O + 10 grms of
Ni Borate just saturated
Clear Sol anode OK pitted +
Cracked

1 Hour

305 1 grm Dimethylamino-
azobenzene - filtered.
Anode Sol OK .5 to break
bright matte -
One corner turned up

Note, last lot seems have Cu in $MnSO_4$ —

307 — 16 grm Phenanthrene filtered Anode sol clear all peeled.

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126 — 1 Hour - 6 gr Manganese Bromide Anode & Sol clear plated OK — sharp pieces on broke 4th band.

310 — 4 gr Paradichlorobenzal Anode sol OK One corner turned up, sharp specs on surface has Copper Color tint,

314 — 2 grm Hydroazobenzol. Anode sol OK all peeled bottom —

304 — 6 grm Alphanitronaphthalene peeled off bottom — one top NG

Citrates are nowhere near as good as Acetate Magnesia —

188 — 6 grms Sodium Tannate
all black Mixed up
Anode OK Nickel Cracked
thin — in scraping it off
breaks up just like flake —

176 — 6 grm Ammonium Formate
Anode OK Sol clear
all cracked & peeled

Drips

Drip 276 — 3 Hours — 2 grms Ni Citrate
Sol & Anode Clean, bath top
Corners loose — Lead but matte
broke 6th Gend. 3 Hours

Drip 276 — 8 grms Ni Citrate R.T.S. 1 OK
Plating OK broke 4th 3 Hours

Drip 276 — 4 gr Ni Citrate
Off but peeled Ends, 3 Hours

Drip 276 — 12 grms Ni Citrate
Peeled off but full specs 3 Hours
rough —

Drip 276 — 16 gr Ni Citrate
One corner left bottom air bubbles 3 Hours
broke 4

NOTE

Try Strong Acetate Nickel
+ Acetate Mg 6 grms
alone no Nq say

1 Hour —

317 6 grms Dinitrochlorobenzol
Sal + Anode OK all Cracked
bad. Nq

309 — 6 grms Trichlorophenol
Anode Solder
Edges slightly Crack + turned
up one side —

324. 6 grms Dioxy Naphthalene
Sal + Anode OK Nearly OK plating
but Center near Top all
Cracked

308 - 6 grms Paranitroaniline
Anode Sal OK, brittle Top where
Top peeled ½ clear across
Rest OK — 1 bend —

332 6 grms Pyrocatechin 1 Hour
Sol dark Anode black
dont rub off Deposit Ck
some peel dark & streaks -

316 - 6 gr Ortho. Toluol. 1 Hour
Sulphonamide - Anode Sol ok
Cracked at Edges, dots & streaks
therefrom broke 1st Grad -
not permanent

318 - 6 grm Thiosinamine 1 Hour
Anode clear Sol slightly
Cloudy Cathode quite thick
black deposit fully 0 oz thick
Very adherent.

319 = 6 grms Orthonitroparatoluol
Anode dark - epoly & Sol clear
all cracked peeled NG 1 Hour

330 - 6 grm Metaphenylendiamina
basic 1 frothes - Anode brown
Very thin deposit Ni Edges all black
NG 1 Hour

315 4 grms Anthracene Sol
Clear Anode slight dark
in spots. Broke 5th - one
edge turned up - 1 Hour

323 6 grms Acetanilide.
Anode + Sol clear 1 Hour
one edge turned up - broke 4th

320 - 1½ grms Paramidophenol.
Sol dark Anode OK
Very thin ni scraper off to powder
NG - has slight black under
like 330 - 1 Hour

327 - 6 grm Beta Naphthylamine -
Sol + a clear all cracked

329 - 6 grms Jolindin base
with - Sol clear Anode OK
Stripped twice completely

328 - 6 grms Benzidine
Sol + a clear all cracked
NG

Note Velande,

Using 6% Roasted $FeSO_4$ but not ~~entirely~~ dehydrated to from dehydrating cylinder at S Lake — prepared thru 180 mesh sieve with CuO 180 " & pressed in small doc baked 1250° Fahr

When put in Water gives the Solution, CoOxy

probably not kept long enough at 1250°
perhaps SO_3 from Fe_2 attacks Cu & leaves $CuSO_4$

338. 6 grms Sodium Nitric
some froth — Sol's cloudy
Anode clean lifted at
Corners broke 1st band
Very bright —

344 — 6 grm Bela Chloro phthalic
Sodium Salt, Anode &
Sol Clear slight Cracks at
Edge, broke 1st band

345 — 6 grm Carbazolic
Brown Sol. Anode little
dark — Ni Very thin precipitate
only a blush NG —

353. 6 grm Glacial Acetic acid
Anode & Sol OK Plating OK
Thin — dead matte.

352. 6 grms Acetone Anode &
Sol Clear cracked fine upward
streaks NG

325 — 6 grms Resorcin —
Anode darkish. NG

339 – 6 grm Palmitate Soda
Anode Sol OK
Plating OK broke 3rd
flat –

340 – 6 grm Sodium Abietic
Sol + A OK Cracked

337 – 6 gr Sodium Caprioate
Bad peeled in liquid
rough spotted –

343 6 grm Paranitroaniline
Sol Clear anode light –
yellow all cracked NG

336 – 6 grm Alloxan Soda
sulfpeled in Sol – NG

322 6 gr Alpha Naphtol
Sol Clear Anode OK
all peeled NG

321 – 6 grms Ortho aminophenol
Sol black, brown froth, Anode
Brown then black ni / NG

335 6 grms Sodium Oxybenzoate
Anode reddish Sol clear
broke 3rd Plating OK

342 Sou froth 6 grms Guarundiar
Carbonate Anode brown
Sol Clear Ni all cracked
NG –

346 – 6 grms Quinine Acetate
Sol clear Anode Brown
Nickel Cracked peeled horrible
NG –

341 – 6 grms Alpha Naphthylamine
Sol clear Anode Brown
all cracked ni thousands of scales
might do for flake

Phenomenon

This gum 50% effering
400 ma chg 10 sec
15 ma discharge
2 1/4 minutes

326 — 6 grms Benzphenon
Oil floats on top Sol
Anode OK No —

350 — 6 grms Hexachlorethan
Anode & Sol OK
~~Gum floats to top~~ Strips OK
plating perfect. broke 9th —

348 6 grms Monobromocamphor
Anode & Sol OK plating perfect
~~Gum floats~~ perfect plating
broke 8th Grid

347 — 6 gr Parandrotalcol
perfect. ~~Gum floats~~ plating
broke 4th Grid —

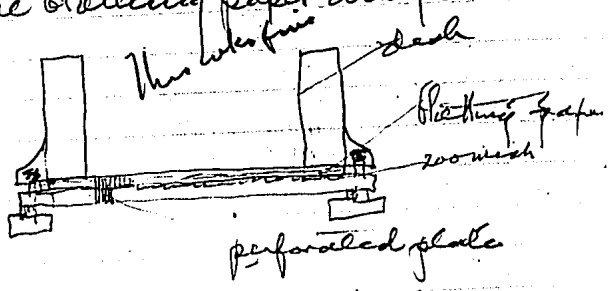
356 — 6 gr Cinnamate Soda
froth on top. anode tinted
darkish Sol cloudy
Deposits $Ni(OH)_2$
adheres strongly
Sol cloudy
Duplicate checked only
No metal — stripped in
both Cracked Edge

349 6 grms Diphenylamine
Sol Clear ditto Quake
~~[illegible]~~
broke 8th - white [illegible] - flaking perfect

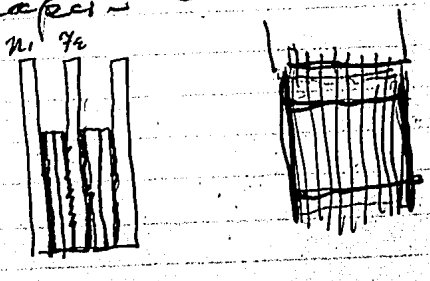
354 - Indine Acetate 6 grms
Sol Black Quake OK
M. all ckd NG 29

Ford 9th Sept 1919

I have found a good way to coat the blotting paper evenly with $NiOH_2$



Ground dried NiOH very fine make a thin Emulsion of it in water stirring continuously then suddenly pour whole into dish in which passes paper forms the Gallon. The $NiOH_2$ settles Even as water filters thru the paper. This leaves a beautiful Even coat of $NiOH_2$ all over the paper.



Sept 9th 1919

Experiments to find an Electrolyte for Lelande better than plain NaOH.

Dissolve recently precipitated $ZnOH$ in NaOH 20% Continuously 50 cc + 12 grms following

Acetates Mg Na-NH_4-Lime

Ba Sr — also saturated solutions alone of the above

also saturated sols of Alkaline phosphates Borates Silicates ~~Chromates~~ also Saturated Sols of Chlorates Chlorides, Nitrates, Molybdates Tungstates Citrates + Stannates Antimonates Sulphates Sulphites Alkaline Carbonates, Tartrates, Citrates

In 20% NaOH 12 grams Citrates Mg — Citrates K. Li Na Salol, Salicylates, Trichloroacetates,

375 — 6 grms Dimethylamido azobenzol
Anode & Sol OK Cracked Edges
1 Hour NG

376 — 1 Hour — 3 grms Paranitroaniline
anode Reddish Sol clear black
deposit thin NG

372 1 Hour 6 grm Metatoluylen
diamine brown Sol dark
Anode black froth
part metal part black deposit
NG

373 — 1 hour 6 grms Paramidothiocresol
froth — Sol black anode clean
black deposit NG

374 — 1 Hour 6 grms Hæmatine
froth anode blackish Pt Cracked
NG

377 — 1 Hour — 3 grms Mono Alpha Nitro
Naphthalene — Sol & Anode OK
peeled off in 20 sec NG

Dup 3 Hours 274 Mg Citrate
8 grammes 8 bends

274 — 16 grms 11 bends Mg Citrate
3 Hours

274 — 4 gr Mg Citrate 1 corner free,
3 Hours

274 - 12 grm Mg Citrate, 8 bends
all good & flat, seem thick —

---

269 — 8 grm Cobalt Citrate
Scarcely any deposit, dark
streak | 3 Hours.

269 2 grm Cobalt Citrate,
Scarcely any deposit, none in
Center | 3 Hours

367 - 1 hour Azo Benzol Hydrochloride
Anode sol ok Cracked Cant
get off NG

369 - 1 hour Nitroguanadine
Anode brown - see Clear
black plating NG

382-1 hour 6 phenorsorcin
floats on top — all cracked
NG —

366-1 hour froth Orthotolidin
Sol dark anode brown
plating NG —

358 1 hour 6 Meta Nitro aniline
Sol cloudy anode brown
Cracked off NG

357-1 hour 6 — Monomethyl paramidophenol
froths bad anode brown
no deposit, dark —

Experiments with the Solutions saved from Ni plating Experiments —
In which Copper Sulphate probably 5 @ 10% is dissolved in the solution to see if can get good Nickel deposit in presence of the Copper —

#77 - With 12 gr Citrate Soda + 5 @ 10% $CuSO_4$, in Saturated $NiSO_4$

With 3 cells 200 ma - Nickel deposits OK - with 1 cell + 25 ma Copper deposits out OK on the Nickel - I also find that with 2 cells ESB at only Copper deposits out no Ni —
I added very much more Copper Sulphate 25 ma Copper only deposits. Am using a Nickel anode (not platinum)
I now put on 3 cells and 200 ma amp - Nickel is dark & poor with so much Cu in —
Think with 1/2 the $CuSO_4$ it will work OK

Great —

I find that 3 cells can be used all the time & Ni anode used by using 25 ma only Copper deposited by regulating Carbon Rheostat to 200 ma Nickel is the deposit but of course Copper is also deposited but to the Nickel color very little Copper is in it but if too much Copper is in sol it darkens & affects the Nickel makes deposit dark & bad —

Perhaps in going over all the solutions I can use heavy amounts of $CuSO_4$ & still plate out good Nickel — This sol is OK for moderate amounts —

Dup 118 — 8 grms Acetate Soda in 250cc Sat $NiSO_4$ 10cc Saturated $CuSO_4$ — deposits Ni dark with 200 ma — 3 cells This dont seem to work as well as 12 g Citrate Soda

Perhaps 10 cc $CuSO_4$ is more than I put in the first experiment,

I better make 10 cc $CuSO_4$ the standard until I get one that with 10 cc plates good Nickel as Copper plates out fine —

I poured out 1/2 the sol & filled up with water to see what Ni would do

296 —— 10 cc $CuSO_4$ ——
200 ma Ni 25 Cu / K Citrate
~ 1st Ni deposit not bright, Cu deposit red & bad

302 —— 10 cc Saturated $CuSO_4$
200 ma Ni OK - 20 ma Cu OK — 1st Coats —
2nd Coat Ni dark NG

134 — 10 cc $CuSO_4$, There is a big precipitate in this sol so it dont look to be a practicable one to work with — 1st Ni OK
1st Cu —

I suspect that I should plate Cu at 15 ma instead of 25 ma & I am doing

177 — 6 Ammonium Oxalate — 10 cc $CuSO_4$ → Ng — 1st Ni Coat on Copper dark NG

137 — 3 gm Lithium Tartrate, Ng dark Ni

145 — 4 g Lithium Sulfate Ng Ni dark Ng

294 — 6 gm K Oxalate — Ni dark Ng

301 — Mg Acetate ? hard mud This works fairly well but some gas comes off Cathode — Ni not bright

I took Reg $NiSO_4$ Conc & added a Conc sol of Mg acetate this works pretty fair still Ni is not bright enough it is neutral = I suppose make it acid by adding acetic — it has 10 cc $CuSO_4$ it seems to work nearly as well

acid as neutral but the brightness of Ni is greater in neutral —

1/2 saturated Acetate Mag
1/2 Conc $NiSO_4$ — neutral
don't do any better than Conc $NiSO_4$ with 10 to 12 grms acetate Mag + neutral with 10 cc $CuSO_4$ in fact not so well —

173 — 10 cc $CuSO_4$ formate magnesium — NG in dark —

170 — 10 cc $CuSO_4$ about same as best of others precipitate gets darker as deposit gets thicker to acid —

276 — NG — 10 cc $CuSO_4$

173 — 6 gr Ammonia Bromide Ni deposit black NG shows must have a Hydrogen absorber to work at all

Pretty Good,

Note

297 — 6 gr Sodium Acetate
this is better than most
12 Citrate I think was
better — with 5 cc $CuSO_4$
this might work possibly
wants more acetate soda
say 12 grms — Can plate
2 of 3 cycles with this pretty
fair — Ni not as bright as it should
be. — This solution
acid — perhaps if neutral
would work better —
well neutralize after few
more cycles

I made it less acid but did not
get it neutral used $NaOH$ $\frac{1}{2}$
much precipitate & crack —
also had it $\frac{1}{2}$ hour on hot
plate 1st Ni plating fairly
bright — Sol is warm think
130° Fahr perhaps less —
This is a good Sol. Use 50 ma
for Cu + 1 amp for Ni —
think could make 50 cycles
or more — Work on
acetate soda —

Good- from chart

#32	75 grms	$Ni(NO_3)$ alone	
122	6 "	Magnesia Nitrate	poor
102	6 "	Aluminium Bromide	
103	6 "	Aluminium Chloride	
259	6 "	Zinc Bromide	
165	6 "	Cobalt Nitrate	
264	6 "	Sodium Nitrite	
3	6 "	Chromous Sulphate	
25	6 "	Sodium Metaphosphate	
258	6 "	Zinc Salicylate	
104	6	Aluminium Nitrate	28th Aug 1917

Disc, good plating

10	6 grms	Boric acid	
1	6 "	Sulphate Alumina	
13	6 "	Na Silicofluride	
55	6 "	Ammonia Alum	
77	6 "	Citrate Soda	
118	6 "	Magnesia Acetate	
136	6 "	Lithia Citrate	
274	6 "	Magnesia Citrate	
269	6 "	Cobalt Citrate	
173	6 "	Ammonia Bromide	
137	6 "	Lithia Tartrate	
87	6 "	Nickel Acetate	28 Aug 1919
297	6 "	Sodium Acetate	flakes yet

Notebook Series -- Notebooks by Edison
Notebook, N-19-09-09

This notebook is a continuation of N-19-08-26. It was used by Edison in September 1919. Included are descriptions of numbered electrolytic and chemical preparations, some marked "Ford" if they appeared promising for use in starter batteries for Ford automobiles. One entry relates to tests with parchment for the starter battery. Another group of entries, entitled "L Ott Experiments," focuses on plating experiments for starter batteries and possibly for disc record molds. Also included is an entry generalizing about the "flake plating Auto scheme." In addition, there are notes on a series of experiments on separating nickel flake, along with experiments on copper and nickel plating for battery cells. There are also occasional entries referring to work on perfecting disc record molds and blanks, as well as to improvements on electrolytic cleaning of record masters. At the end of the book is a list, transcribed and amended from N-19-08-26, of experiments in progress or finished as of August 27, 1919. The entries in this book again reveal the convergence of Edison's work on battery and disc record manufacture in terms of electroplating. The notes indicate that Adolph F. Gall, Frederick P. Ott, and Ludwig F. (Louis) Ott assisted Edison. Inserted into the book is a communication from E. E. Dougherty about work in progress. The front cover is labeled "Very Important" and "No 4 General Book Sept 9 1919." The pages are unnumbered. Approximately 100 pages have been used.

Sept 9 1919 — Plating MnO_2 & Ink

359 - 1 Hour 6 grm Phenol tribromide — Anode & Sol OK bottom stripped
NG

379 - 1 Hour Metaphenylenediamin Basic froth. Muddy black deposit on Cathode NG

365 1 hour 6 gr Perchloro benzol Anode & Sol clear Cracked & peeled —
NG

360 - 1 hour 6 grms Retene — Sol & Anode OK peeled & cracked
NG

362 1 hour 6 grm Alpha Naphtol Sol cloudy Anode clear all cracked & dark at Edges
NG

364 - 1 hour 6 grms Paranitrochloro benzol Clear Sol Anode OK all Cracked
NG

Sept 10 1919

334 - 1 Hour 6 gm Nitroanilin Ortho
Anode ok - Sol dark yellow
thin deposit center metal
outside black NG

393 - 1 Hour - 6 gr Paraphenylendiamin
Acetate, froth, Anode black
black thin deposit NG

378 - 1 hour 6 gm Amidoazobenzol
Anode & Sol Clean
All peeled & Cracked NG

381 - 1 hour Trichlorophenol
Anode & Sol Clear peeled NG

380 - 1 hour 6 gms Benzidin base
froth, Anode Clean
Cracked & peeled NG

371 - 1 hour 6 gr Azobenzol.
Sol Clear Anode Clean
Cracked & peeled off - NG

363 — 1 Hour Sol Clear Anode OK
6 gr Anthracinon — Peeled —

392 — 1 Hour 6 gr Diphenylamine Acetate
Anode & Sol Clear Plated OK
1 corner slightly raised, broke
1st bend —

277 — 1 Hour Anode clear
Precip in Liquid of $Ni(OH)_2$
Solution is Nickel Polarized
Nitrite alone, good for making
$Ni(OH)_2$

388 — 6 grm Cresotinic Soda 1 Hour
frothed — Anode clear sol dark red
Cracked & peeled NG

391 = 1 Hour Alanin - Soda
Sol slightly Cloudy Anode
OK Cracked & peeled NG

203 — 1 hour 6 gr Amidopropionate
of Sodium — froth sol cloudy
Anode reddish —
All cracked & peeled NG

Lithia Benzoate

NG

Duplicates Sat Sol N.504
No 134 —
of Lithium Benzoate,
3 Hours 100 ma per inch
All badly frothed seems to a new
chlorocellulose Solutions were
Clear when put in —

2 grms of Li Benzoate broke 4th
flat full little spots sunken
bubbles I guess — turned up along Edges

4 grms flat, 5 bends, turned up
along Edges Considerable depressed
spots

8 grms — slightly turned at Edges
full spots. broke 5

12 grms — Spots less turned
up considerable all
along Edges + top + bottom
Ends broke 3rd

16 grms no improvement

Lithia Benzoate NG

281 – 1 Hour 6 grm Magnesium Nitrite – Sol & anode OK Black paste, good adherance

395 – 1 Hour – 6 grm Chrysophanate Sodium Anode OK Sol black peeled & cracked NG

40 – 1 hour Saturated Sol of Nickel Chlorate froths Anode OK Sol Cloudy NG – black powder probably Ni + some Chlorate NG

390 – 1 hour 6 gr Oxy Naphthalate Soda froths. good adherent Nickel hydroxide Coat most has already come off – wants paper argument

50 – ½ Hour 6 gr Paramidophenol Sulphate. Anode brown has a deposit Cathode all cracked not peeled NG

This might be useful

Ford — S

149 — 1 hour 6 gr Cadmium Bromate Anode sol clear only little Ni at top — all the rest of surface free of nickel —

387 — 1 hour 6 gr Camphorate Sodium froths anode turned brown Sol clear One corner turned up — broke 3rd — Matte Lead Color

361 — 1 hour 6 gr Monochlorophenol peculiar smell Sol cloudy Anode clear All curled + Cracked NG

359 = 1 hour 6 gr Ulmic Soda Sol dark Anode OK Whole bottom turned up NG

36 — 1 hour 200 cc H_2O saturated with 30 grms Ni K Sulfate Sol + Anode clear Then made up to 250 cc with Strongly adherent thick Nickel Hydroxide —

Good

383-1 hour 6 gr Urate Soda
Sol + anode OK all
Cracked + peeled NG

286-1 hour 6 grms ? ? is there
any $NiSO_4$ in this ? -
precip — anode clear —
peeled + Ckd NG

370-1 hour 6 gr Para Anisidin
froths Sol black anode OK
Ni in Center Borders black NG

368-1 hour Aceto Toluidin
Sol + anode OK make flake
1 NG —

86- Nickel Formate
Cloudy - froth Sol has
precip + No $NiSO_4$? queer in
this anode OK black Center
Green Ni Hydrox around
Edges -

Try all the Chlorates with Ni Cathode - for Form

Form →

Form →

Form →

394 — 1 hour 6 gr Valerianate Soda froths much - Ni all ckd + peeled NG.

355 — 1 hour 6 gr Capraivic Soda froth - Sol + anode ok peeled off in liquid NG

331 — 1 hour 6 grms Paranitroacetanilid Sol + anode ok fine Cracked NG

150 1 hour Cadmium Chlorate 6 grms Anode + Sol ok Makes a Nickel Mud - adherent May be of use,

254 — 1 hour 6 grms Zinc Chlorate Sol + Anode ok Very tenacious black substance May be useful, quite thick

120 - 1 hour 6 grms Magnesia Chlorate Sol clear Anode ok Black smooth deposit - thin —

Good—

Note Chlorates give black deposits on Cathode, probably black Mn hydroxide

333 – 1 hour Ortho nitro Benzaldehyde Sol + anode OK peeled + Cracked — NG

164 – One hour 6 gr Cobalt Chlorate Sodium – Anode clean Very adherent black deposit Cant rub off May be useful — It comes off as a sheet on making it anode in NaOH 140 ma for 2" its quite tough like thin hard rubber, S S + is not metal –

384 – 1 hour Para Quinolin Sulphuric Soda Sol + anode Clear. Cracked + peeled NG

209 – 1 hour 6 gr Resorcin Sol + anode Clear Cracked along Edges NG

385—1 Hour 6gr. Para Mono
Chromo Benzoate Soda
Sol clear + frothy
Anode brownish brake 3"
one Edge turned up slightly at
top —

386—1 hour 6gr Aloetinic Acid
Soda, Very large froth
Anode clear Sol very cloudy
No deposit NG

35—1 hour Saturated
Sol of Succenate of
Nickel — Some white
flakes in Sol otherwise
Clear Anode Clean
peeled, brittle, few cracks

28—1 hour Saturated Sol
of Ammonium Oxalate of
Nickel Sol + anode
Clear think dark
deposit, brittle + NG

268 – 1 hour 6 gms Antimony Citrate
Sol clear Anode OK
Top peeled, brake 1st band

154 1 hour 6 gms Cadmium
Selenate, Cloudy Sol –
Anode black thin –
All cracked up NG

396 1 hour 6 gr Phenatol
(Ethyl phenate) Sol clear
Anode OK one Corner turned
up-peeled, Very brittle film

74 – 1 Hour 75 cc Saturated
Nickel monochloroacetate
diluted to 250 cc
Sol clear Anode OK
Part $Ni(OH)_2$ + part Ni NG.

289 – 1 hour 6 gms Ferric Potassium
Oxalate. Clear sol Anode
brownish tint Edges
Cracked –

Forward

67 – 1 hour 3 grms Xylidin Sulfate, dark sol Anode black tint, M all mud flocks & all cracks Varnish NG

283 – 1 hour 6 gr Mg Nitly Oxalate. Sol cloudy Anode OK Nearly peeled off – OK but Grille

284 – 1 hour 6 gr Palladium Nitly Oxalate Cloudy Anode OK Perfect but self dropped in Sol Very bright metallic –

139 – 1 hour 6 gr Lithium Chlorate Sol Clear Anode OK Black very adherent deposit

287 – 1 hour – Antimony Soda Oxalate Cloudy Anode OK all peeled + CK at Edges

44 = 1 hour Saturated sol Nickel Potassium tartrate, 6 grs precip – Anode OK Very thin dark deposit NG

Found

29A — Phenomenon
Anode bright but
covered all over by
a transparent glass
like substance brittle
its like mica
Investigate it

397 — 1 hour — Picrate Soda —
Clear sol Anode tint red il
part Ni + part black film over
Ni —

29-B — Saturated Sol Oxalate
Soda + Nickel — 1 Hour
Light Colored sol cloudy
Anode bright, some green
NiOH, + black NG

29 A. Saturated sol of 1 Hour
Potassium Nickel Oxalate
deep green sol, clear
Cathode No metal coated
thin yellowish very adherent
deposit, Anode no apparent

105 1 hour 2½ gr Potassic Aluminum
Tartrate Sol Clear Anode
OK Edges cracked
Top peeled —

288 — 1 hour 6 gr Cobalt +
Potassium Oxalate.
Sol cloudy Anode OK
Cracked + Peeled

(35)

Phenomenon →
Note well —

↓

Note

Dup 233 8 grms Sodium Hippurate
Sol - anode OK peeled - almost
Entirely off & 2nd Coat on

Dup 233 - 2 grms Na Hippurate
Sol Cloudy anode brown
~~tent~~ - Plated OK -
broke 2nd Gend

Dup 233 4 grms Na Hippurate
Sol Cloudy, Cant get off - pitting it drop off in back & 2nd coating adhered

Dup 353 - 20 grms Glacial Acetic
acid. Sol & anode OK
Very thin - perfect, broke 1st
Gend, Curls up when
pulled off -

ditto - 12 grms Glacial Acetic
Thicker - broke 1st Gend
Curls up

ditto 40 grms Glacial Acetic
found it OK but ~~left~~
curled away from Cathode
but no ni on Cathode
broke 1st broke 1st Gend -
streaks

What is this
Reaction
Curious —
may be useful

Sat Sol Ferrous Sulfate
6 grms Magnesium Acetate
all mucked up nearly
solid red stuff —
Anode Sol only slightly
Cloudy / Other Clarified
3 40 pm — off 5 pm — only traces iron
deposited that dark —

Dep 339 — 16 12 8 4 + 2
grams Sodium Palmitate
in 2 hours all peeled
Cracked + NG —
Very said Even 2
grams dropped dissolved —
NG

Dep — 297 — 3 hours. 40 grms
Sodium Acetate in 250 cc
N. SO4 — all dissolved —
froths much — Sol clear Anode
little darkish.
Plating thin — spots in Center
none at all Cant strip
only little — Sol must
attack the metal
probably peeled & fell in Jar

Dup 297 – 20 grms Acetate
Sol – only little froth.
Sol fairly Clear Anode
darkish tint at sides –
found strip peeled its thick
& good, pretty peeled
in 2 3/4 hours broke 2nd bend
its springy & some curled
but easily acts.

Dup 350. 2 grms Hexachlorethane
didnt all dissolve
Sol clear Anode ok
Edges turned up. good plating
broke 2nd sets – fair result

~~Dup~~ 400. Mg Palmitate,
2 gr not all dissolved
Sol clear Anode OK
turned up at top – full
~~depressed bubbles~~ . 5
bends. Has no spring
to it – dead soft –
as it was full of bubbles
rotation might work

Ford-Starler Cranes artificial parchment #56. after soaking for 48 hours in 20% NaOH, then washing out the NaOH I find it very tough. While in NaOH, if you ~~bend it~~ can bend it & it will smooth back but if you leave it bent & wash out NaOH the bend is permanent. This parchment is a red color apparently. I don't know the original thickness but water wet it appears to be swelled to at least .040 to .050-

Mill 50 Woven Antique has swelled to .20/1000 & I think is thick enough for separators.

Mill 20 Antique is thicker,

Crane Parchment #44
has swelled to 1/32 about its
tough,

another parchment is
about 20/100

No 6 swelled to 1/32
tough - its like parchment

Ditto #5 ok 1/32 tough

#4 same smoother

#3 has swelled to over
1/16 ?

The thickest swelled
to 1/8 scant
think this is blotting
paper, No 4 seems OK
but could be thinner

I think the Nu Off
parchmentizer all the
above papers —
How about Resistance

perhaps we may have to use 3 or 4 very open papers so parchmentizing action of NaOH will not close the holes + then put them together.

We should get dog smooth plates lay paper between each plate both side holes we prepared in battery soak in NaOH 20% for tighten the bolts with springs + set aside in NaOH 20% for time tests after measuring everything — dittos with carbolos

dittos papers at 120° Fahr

fond

→ NOTE

48 – 1 hour 6 grms Pyridin
slightly acid – Sol + anode OK
Scarcely a trace of deposit

231 – 1 hour 3 grms Salicin
Clear Sol + anode
Cant strip

98 – 1 hour 3 grms Caffeine Sulphate
Sol + anode OK black deposit
come in under + NG

37 1 hour Saturated Sol of
Nickel Bromate.
Sol dark anode OK only
few dabs of black stuff

68 – 1 hour 6 grms Picolin –
Sol + anode OK dark very
little metal

401 – 1 hour 6 grms Benzidin Acetate
froth – Sol dark Anode OK
Scrapes off to a flake
fairly thin

Note

Note

398 - 1 hour Paraamidophenol Acetate, froths, Very Blue Sol - Anode at Very thin black deposit -

Dyr.

Note. I took a piece of of CuO plate cut from Reg S Lake plate 5/8 ogl & the small Zinc Cast 1/4 x 3/4 - 4" long put it in Conc Acetate soda to which I added only a little 20% NaOH, probably 50 cc or less Total Electrolyte 250 cc, its been on 74 hours at noon Sept 15 Sol Clear been at 50 ma - 66 Volts 15th - It looks as

If a Leclanche Battery could have an electrolyte of strong acetate soda & not much NaOH, & dissolve more Zinc than straight 20% I notice some caffey goes into sol & is reduced by the Zinc to a black float also some on the Zinc but when rubbed Zn is bright — Used no Mercury

It is probable that there are numerous solution strongly alkaline that will dissolve much more Zinc that reg 20% NaOH & some will probably give better voltage Try a great number —/

Dulka little Cell -	12 ma —	Volts 70
	25	68
	50	64
	75	64
	100	60
	150 —	56
	200	44
	300	42
	400 —	38

Apparently with 4 times the surface giving 12½ Ma on this which is 4 times wanted gives same density at 50 Ma with Voltage of .70 Volt

In other words to raise delaude Voltage increase the surface of the CuO plate,

133 - Dup. N_2SO_4 Sat + 20 grms Lithium Acetate, not all dissolved, froth -/
Sol clear deposit ok but one corner burned up at top few bubble seeds.
½ day broke 3rd Gend 3 Hours

296 - Dup 3 Hours — 20 grms Potassium Acetate, froths - deposit ok all peeled twice, K always bad

Put in 6 gr Acetate Mg

Mg - now ~~green hydrated~~

Dup 118. 20 grms Magnesium Acetate, all Sol. Sol a little Cloudy some froth not mixed Anode OK brake 2nd top edges turned up plating OK,

402 - 1 hour 6 gr Sodium Acetate in 250 cc of a saturated Sol of Nickel acetate — Sol clear anode OK found it OK & peeled in the Solution & a 2nd good Coat on brake 1st Good Curled 3 Rev

69 - 1 hour Piperidin Sulfate Sol & anode clear No deposit red color —

75 - 1 hour Saturated Sol of Nickel trichloroacetate Anode & Sol clear scarcely trace of deposit.

put 6 Mg Acetate
in all cracked
peeled terribly

Fond

107 - 1 hour 6 gr Ammonium
Iron Alum —
Sol + Anode ok Come off
in Sol — Curled & Revolutions
broke 1st 6 cms — + new plating
on

75 Dup again but with
6 grms Acetate Magnesia
all covered with
N ~~OH~~ 2 green not
very adherent 1 Hour

107 Dup again with 6
grams Acetate Magnesia
Cracked + peeled terribly

349 1-Hours - 2 grms Diphenylamine
Sol clear Anode ok
fine plating Cant get it off —
I wonder if it affected the
8/4

Dup 248 – 1½ Hours 2 grms
Monobromin Camphor
Sol a Quite OK –
peeled at Top ——

291 – 1 Hour. 6 gr Pulosin
Molybdate. blue Quite
blue – No deposit whatever

404 Saturated Sol at 1 Hour
Nickel Acetate 50 grms
Sol Clear Quite OK 1 Hour
Top turned up broke 3rd

404B 1 Hour Saturated Ni Acetate as
above but 6 grms Mg Acetate
Sol Cloudy. Quite OK
End peeled broke 1st

Do more Dup
on 403 →

403 6 grms Sodium Butyrate
Sol cloudy, drops off
Plating perfect
Broke 4th

Dup 118: 40 grms Mg Acetate
3 Hours — dissolved in 1 to 1
H_2SO_4 + H_2O - Sol cloudy
+ slight sediment, Alloy
black. Cracked at
Edges, breaks 2nd time

403 6 grms Na Butyrate
all sol. Sol cloudy
drops off — flat.
broke 10th

Goll reports 17 1919 Sept

that the original 35 Litres of Conc $NiSO_4$ containing 2½ gms Magnesia acetate to Litre, had originally a Specific gravity of 1.300 — Since there have been 13 strippings of Nickel disc from it each Calipering about 5/1000 He has added so far more than 4 Litres of distilled water to allow for Evaporation ~~when~~ the specific gravity is now 1.220 it is very acid — but the 13th stripping is 5½/1000 10 Hours at 1½ to 8 amperes this Current with present Solution raises its temperature to 103° Fahr which causes evaporation

[55]

I notice all the 1 A group Expmt Nickel Acetate gave a big bubble froth on top of Each cell —

Lott Experiments. 17 Sept 1919

Sol 403

This is 1 A Expmt
6 Cells 250 cc Conc $NiSO_4$
each has 6 grms of Acetate of Magnesia + $NiSO_4$ unpurified
Each cell Marked 1 A 2 A etc
Dingl's Strip Anode used 8/4 2" Cathode. 400 Ma used, instead of the usual 200 on the 2" This is at rate of 200 ma per inch

1 A taken off in 2 hours
2 Corners turned up very slightly white Matte, flat OK. broke, 2nd bend another bend 3rd time
The Anode is very black
Some deposit on it very thin —
Acidity of Solution is

Original Sol. 0.10076 — based on the acid
1 A 0.30228

per 100 CC — Multiply by 2.5 for 250 cc

2A. Olt 1A Exponent. 400 Ma in 2"
Acetate Mg 1 anode
3 Hours plating. Anode in one
place dark other part clean
Sol very slightly cloudy
Plating 1 Cor very slightly
lifted other Cor 3 fine cracks
left gray
Strips of Coat Off
broke 4th bend,
bending whole width broke
4th bend —
Acidity —

2A 0.50380

400 ma on 2"

A 3. Ott = 4 Hours plating
2 Corners turned up a little
1 on top on on bottom
flat OK plating —
bending whole broke
6th bend — Anode black
thin — Nickel appears to
have no spring at all
stays where bent

Acidity

0.69532

400 ma

4A, 5 Hours, Oks Except flat, Two Tab Corners raised little. otherwise Ok
Bending Whole brake
3rd its so thick if thinner it would have bent more
its tough no opening to it
Anode lighter black -
Must be some impurity in the solution

Acedly

1.0076s

Otto 1 A Equipt 18 Sept 1919

5 A. 6 Hours

1 Corn Top lifted up — flat generally
Poorly Varnished Broke
9th Bend full size across
No spring — perfectly soft,

I think the varnish is attacked
as has no shine where immersed

Anode has only a slight tint
brown —

Acidity
1.15874

Total acidity increased
with the 250cc
327 grammes
of Hours plating —
figured as H_2SO_4
& but its acetic
& not H_2SO_4

Oct Expt 1 A

6A. Plating OK
only faintest lift at Top +
End fine — its dead flat
broke off the bend fade
across — anode brown film

200 MA per inch is
OK.
As there are 45 inches
to the disc immersed.
This shows that discs
Can be plated at 9 amperes
density with fine results
+ probably 12 amp if
necessary — We are
already using 7 @ 8
amp getting off fine discs
005½ thick 14 of them

Acidity
1.41064

If found that it is all metal
Except a blue on outside, Its
brittleness is probably due
to the simultaneous deposit
of blue hydroxide & metal
+ this peculiar reaction
is probably unsuspected
cause of plating troubles
in other solutions —

Investigate

250 cc Nearly saturated sol of
Cobalt Sulphate
1 Hour ~~[illegible]~~ 100 ma per inch

There is a deposit of metal
over that a green hydroxide
its not peeled or Cracked
it chips off by knife
Excessive brittle, Solution
appears acid —

Took it & made it Neutral
by $Co(OH)_2$ — then for fear
they had not added ~~[illegible]~~
1 Acetate Mg I added
4 grams more —
1 Reg Cathode 200 ma —
1 Hour
Frothing —

Same thing occurs
blue deposit something
must be wrong with
the Cobalt its right thick
but flakes off brittle probably
a hydroxide coating

424 — 1 Hour 6 gr Sodium Lactate Tracks Sol Cloudy/Anode OK All Cracked NG —

425 — 1 Hour .6 gr Magnesia Butyrate Sol/Cu Cu Anode OK — has 250 cc of N_2SO_4 — one Corner turned up — broke 4th band — Can prob make this work flat, sets.

Note = I find that 250 cc Conc N_2SO_4 with from 2 to 12 grams Acetate Nickel in which has been run 4 hours at 200 ma plating is acid & that it can be neutralized with 5 Lake $NaOH$ which has been dried with $NaSO_4$ etc in then recotaled but not again dried if this is

Kept damp & powdered up, it will completely neutralize the acid of Bring Solution to neutrality if warmed to 110 @ 115 for 3 or 4 hours, — Of course the freshly precipitated will work much faster. As the solution in plating goes to 100 a little heating the filter tanks of 10 or 15 deg will keep it neutral by passing thru the filter press —

We could have a double supply in stride tank drain off acid sol + immediately replace by new sol + then old solution could be neutralized ready for another change —

Dups of 87. last run in this book
I neutralized all 4 with percolated NH_4OH at 115 Fahr —

Now rerunning at 4 amps
Milamp for 4 hours —

Dup 87 — 2nd Run after neutralizing by percolated NH_4OH, at 120 °Fahr

4 Hours run at 200 Mke per sqr inch —

12 grms stripped about 3 hours

2 grms lifted some + cracked at Edges. soft

The last plating seems to have Split + Curled up but main body ok Raff

87 — 16 grms Iron turned up
+ Copper color —

4 grms. OK but last layer
turned up a little + Cracked
Very tough — Copper Color

I believe this solution
has Copper in it

It has —— boy had
anode so low that
Copper wire acted as
anode & shows eating
away —

3rd Run 4 hours
400 MA — with anode
not so deep in solution
All are acid. —

12 grms - Copped - Curled at edges
+ Rep. but good
16 Cracked & split Very Copper
4 = Copper - one corner left
only OK
7 = OK but waves in it

423—6 grm Potassium Acetate
250cc Nickel Acetate.
Neutralized Dol Cloudy
Anode OK 1 Hour
All cracked NG

421—6 gr Manganese Acetate,
250cc Nickel Acetate
All Cracked NG

422 6 gr Sodium Acetate
250 cc Nickel Acetate
Cracked at Edges Cantaloupe
NG

412 6 gr Barium Acetate
250cc Nickel Acetate
All Cracked NG

417—6 gr Lead Acetate.
250cc Nickel Acetate
Black Mud

418—6 gr Acetate of lime
250cc Nickel Acetate
All Cracked NG

4th Run of the 87 Dup Y
neutralizing, its get Copper in
Y9 put the K Cells on with
only 25 ma to plate Copper out

Eating off Nickel from
working moulds —
$2\frac{1}{2}$% H_2SO_4 — at 180° F. on
hot plate does it in
12@15 hours — any
higher amount of acid
apparently don't
diminish the time —
up to 50% water 50%
H_2SO_4 — This works
OK in 15@18 hours

Acetic acid NG —

10% H_2SO_4 with some H_2O_2
15 hours OK — good —

5% HCl 15 hours 180°
no doubt ~~[illegible]~~
it changes and will
do it —

10 Oak 2½% to 5%
with air & 180° Fahr
should do the trick
fine —

4th Run of 8% — Magnesium Acetate

2 gr OK but has the waves
1¼ gr waves 1 Corner lifted
16 gr Waves 1 " + Split
12 gr " Split in 1 place
others OK — No Copper Colors
All Seam Thermos Chain
used —
Thesol is rather strong
I put in 1/4" water &
started them again
for 5th Run

Flake — 20 Sept 1919

Reg $NiSO_4$ Conc + 10 cc $CuSO_4$ — plat anode for Ni plating Copper anode for Cu plating works much better than with acetate Magnesia —

Reg $NiSO_4$ — 250 cc 10 cc $CuSO_4$ and 20 cc free glacial acetic acid — This is the best of all tried + possibly it will be commercially successful. It needs acid — lactic seems especially desirable as it does not appreciably attack the plated Nickel while the 3 times longer time Copper is being plated.

Needs improvement as do the Copper that makes Nickel plated out dull matte + undesirable. It is very necessary to have

the smallest possible quantity in solution with 10 cc $CuSO_4$ in 250 cc $NiSO_4$ – there is too much Copper as it affects the Ni if I use only 5 cc there is not enough $CuSO_4$ at Cathode to cover the previously plated nickel Now here is the Egg of Columbus Use only 3 to 4 cc – agitate while Copper plating this will bring Enough Cu to anode to give good Coat, stop agitating just before Ni starts plating say ½ minute before then no fresh Cu is brought to ~~cathode~~ when Ni plating but plenty when Copper plating.

It is desirable that the Cu should be a constant quantity I use a Copper Anode which puts in as much as is taken out Then a Ni Anode to supply that taken out, Ni Anode has large surface —

but on Ni plating considerable in fact all the Cu in vicinity of Cathode plates out with the nickel, + therefore a sub Cu anode should be connected to the Ni anode thru a Rheostat which can be adjusted to give to bath as much Cu as it removes.

Any minus can be corrected from time to time by adding $CuSO_4$

I have just got bright Ni + Cu by making Reg $NiSO_4$ 1/4 strength pouring out the acidified sol of 250 cc Conc $NiSO_4$ containing 10 cc $CuSO_4$ + perhaps 30 cc acetic acid - leaving say 75 cc of sol + adding water to bring to 250 cc. By stirring when plating Cu + not while plating Ni stopping 1/2 min before Cu plating

finished got 4 cycles
of shiny Cu + Ni —

use 30 Ma on Cu 200 Ma
on Ni — I have been
using 350 @ 500 Ma on
Ni —

I stopped stirring
then scarcely a sign of
Copper deposited as
now there is only 2½ cc
+ not enough Cu in Sol at
Cathode to make an all Cu
blush in 3 min —

I will now stir — its OK
When stirring fine Cu deposit
+ as there is very little Cu near
Cathode + stirring stopped
½ min before Ni plating
the Nickel is good —

I will dilute it ½ ~~again~~
+ try again —

This works even better

It looks as if not much of any Copper need be in solution that by vigorous Circulation the current action on the Cu Anode produces sufficient Copper Sulphate to supply the film & the Cu Anode could be cut out & switched to a Ni anode so as not to make any more Cu & what $CuSO_4$ that was in sol would be plated out before Nickel started depositing

If this works strong $NiSO_4$ sols could be used, reducing & Continuous plating —

The Nickel plating time could be increased to 3/4 min or Even 1 min & Copper reduced from 3 min to 2 min depending on the circulation —

Sept 20 1919

5th of of 87 — Bent whole strips —

2 gr Waves. but OK 10 to bend

4 gr No waves OK 10

12 gr Waves - 1 Cor lifted up 11

16 gr Waves 1 Cor " 10

Same as 12

This is best lot yet showing that it improves due probably to more free acetic —

Will run 6th run

All are thicker than previous platings

at 400 ma both Cathode + Anode gas very much

Yet plating good —

Flake — Used 300 cc saturated N.SO4 — 3 cc CuSO4 —
If stirred while Cu plating stop stirring after 2½ min plating for ½ min 10 Ma per inch
deposits Cu OK if 25 Ma per inch Ni deposits must keep at not more than 12 Ma per sqr inch for Cu —
~~Flash~~ made several cycles OK —

I then took 75 cc of above solution & diluted it with water bringing it to 300 cc — This reduced the Cu in solution to sevententh of 1 cc. — Even on stirring it scarcely showed a flash of Cu, However if I had very vigorous circulation I feel sure it would have deposited good Cu,
The nickel is ok but instead of 250 Ma per inch in Conc Sol had to reduce to 100 Ma per inch —

A/3 300/74

Everything goes to show that
5 cc of $CuSO_4$ saturated in a
Conc Sol of $NiSO_4$ in the
Cold & Vigorous stirring
that Copper films will be
satisfactory 10 ma per inch
& Nickel 200 ma per inch
but think should have
1 min on Nickel & $2\frac{1}{2}$ min
on Copper to give right
flake
Also it may be necessary
to Triple plate Copper Every
15 @ 20 Cycle to correct
character of deposit.

With the 75cc Weak Solution
I notice that without stirring
no Copper is deposited
but plenty when stirring
also notice that without
stirring the Nickel deposited
is insufficient to ~~cover~~
hide the previous Copper

from this the only inference is strongest Ni Solutions & Cu so low as not to appreciably depositing at 10 ma per inch when not stirred & the stirred with a vigor sufficient to bring ~~the~~ necessary Cu to the ~~[illegible]~~ Cathode —

I noticed bright wave finally depositing on Cu & I added a little acetic.

It seems necessary in all sulfate solutions to have some free acid & acetic seems best,

NOTE I find that with 8 gms Ni acetate in the 300 cc Cone $NiSO_4$ + 3 cc Cone $CuSO_4$ that no gas comes off on Ni plating 150 ma

per inch + think this is
best solution ~

I have just made 6 cycles,
12 Ma - per inch on Copper plating
150 Ma on Ni plating —
3 cc $CuSO_4$ — Stirring at about
of Copper plating for 2 ½ min
stopping stirring for next ½
min to allow solution to stop
circulating + then Nickel for
30 seconds —

The results are perfect

Think 100 or more cycles
are OK —

Fred is to rig up stirrer
+ contact to stop it for
1 minute - during last ½
min of Cu plating + during
whole of Nickel plating

6th Run – 4 hours & 10 min

4 grms Perfect — flat
had some few sharp points on
9 blends –

2 grms – flat, had left at bottom
slightly so a little ni placed in
9 breaks

16 grms Scarcely any
deposit focend film self
stripped left off

12 grms Only a thin
deposit very adherent
had trouble strip it off
film in col self stripped off

[illegible]

[illegible]

[illegible]

The 7th run of 87 Dropped
I neutralized the 12 gram
acetate Ni Cell & left all
the acetic acid —
see next page

414 = 250 cc Nickel Acetate
6 gr Cobalt Acetate
1 Hour peeled in Sol & only

419 — 250 cc Ni acetate
6 grms Lithium Acetate
peeled in Sol

405 — 6 grms Magnesium
Oleate in 250 cc $NiSO_4$ Conc
Cracked edges — 1st time

413 — 250 cc Ni acetate
6 grms Cerium Acetate
peeled in Sol —

Ford

Note

12th Neutralized this is not as good as 16 not neutralized — its necessary to have good acidity

415 — 250 cc Ni Acetate
6 gr Copper Acetate
Bath — N 9

426 — Eat with Ni Acetate,
250 cc green hydrogen on
Cathode pool

4th Run of Dup 87 — with 12 gr
cell neutralized

16 grms — Curled away at top &
sides but not Entirely all
covered with Copper

2 grms flat but it had separated
near top a thick of Ni on Cathode
but OK

4 grms Same as 2 gr Copper
10 breaks —

All above plating OK
but stripped but flat if these
Conditions would be perfect
I will not make 8th Run
the 12 gr neutralized it also left Cathode

8th Run 4 hours Dec 87.

Note 12gr was neutralized on 7th run

2 grm - float OK - just lifted a trace at bottom but only a blush of Ni on 8/4 at Corner Tinged with Copper

4 grammes nearly loose but only little blush of Ni on 8/4 at bottom - float, Tinged with Copper

12 - loose in Cell - 8/4 only little Ni on probably stripped 3 3/4 hours float tinged Copper

16 - tops Edges Turned up nearly loose only blush of Ni on 8/4 - Badly Coppered

Copper may come from Lead Vermicular Tube acting over night.

Put in for 9th Run

Edison Special A
I am putting up 4 cells
250 cc Conc $NiSO_4$ —
with 2 4 6 + 10
grammes acetate nickel
to be run continuously
on Cathodes which have
no 8/4 on so they could
not strip - using 400
ma — & continue a
longtime —

9th Run Dup 8/-

12 gr neutralized others not.

2 gr lifted one top Corner
leaves — no Cu — seems thinner

4 gr — nearly flat top lifted
scarcely a blush of Ni on 8/4

12 gr — lifted bottom Thick
only blush of Ni Nearly
flat,

16 — Curled up &
Considerable Nickel on
8/4 — Spongy —
looks as if Plate was
approaching failure
its too acid —

On for 10th plating

Note — Sept 23 1919

Carbonate Nickel is just as good if not better than Nickel hydroxide for neutralizing the $NiSO_4$ Conc & acetate Nickel solutions after they get acid & will work better in fatter [illegible]

10 Run Dep'd 8½ —

16 gr lifted all around Edges & considerable Ni at Edges — nearly flat —

4 gr stuck tight, got it off ok spongy + not thick

12 = lifted sides + bottom flat, little thicker than 4

2 gr nearly off & 8/4 almost covered, matte,

C1173

But I note that the nickel after 30 cycles is very brittle & broke away possibly it is due to float $NiCO_3$ as we have trouble with float ferric doing same thing in disc Ni plating

Sept 24 1919

The flake plating Auto Scheme the solution soon gets too acid and the very slight deposit of Copper is soon dissolved by acetic acid that is free when too much is free, by keeping a small quantity of Ni hydroxide or better still Ni Carbonate the Revolving Stirrer breaks it up to fine pulp — the solution becomes nearly but not perfectly neutral which is just what is needed. There is always a little Ni Carbonate floating in the solution — in this case the Copper that is plated on is not dissolved or is OK as well as the Nickel — poor efficiency of Ni anode is thereby corrected but we must get high efficiency on our Copper anodes or be compelled to add Copper from time to time I prefer large surfaces of Copper

The Carb Ni pulp floating in solution does not get attached to Cathode or interferes with plating

Of all our Ni Solutions
Lithia Citrate gives toughest Nickel
+ 100% OK

250 cc NiSO4	2 gr Citrate Lithia		broke	18th
	4	"	"	20th
	12	"	broke "	10th
	16	"		13th

Nickel acetate next toughest

250 cc NiSO4	2 grm acetate Ni	OK	broke	8th
	4	"	OK "	10th
	6	"	OK "	4th
	8	"	OK "	10
	12	"	OK "	3rd
	16	"	OK	3rd

Just had a test of the New Ball (Hardinge) for grinding up 1% on 30 mesh New Blank mix of Clay Cotton flock + Oxidized Linseed oil + Oxidized Rosin — Mixed together in powerful Steam jacketed Mixer with paddles Steam heated — The Capacity of their smallest

Mill ——— size gives us
good OK mix with 1% of
stuff left on 30 mesh. This
Consists ~~of~~ mostly of flakes
made by dropping of one on
another from height 2 or 3
ribs in Motor leaves only some
of balled Cotton + lies 1%
is put back for reprocessing

The Capacity is 75 lbs hour
Speed 38 Rev —
Think 85 to 90 lbs hour is
OK yours —
Dead sure of 2000 lbs in
24 hours — or 1780 520 gram
disc blanks —
Possibly 2000 blanks
per Mill —

11th Run 87 Dup - 400 ma

12 gram was neutralized on the run & thick -

12 gr — OK only little Ni on 8/4 -

2 grams ~~to Thin Coat off~~ THE NOMENON ~~Voltage Very Good but to Limit efficiency was good~~ ~~Ni to Exchange~~ ~~with the H2O~~ Wavey Came off in the solution fresh deposit thin about right thickness

4 grams Wavey one cor lifted but its about right thickness only little Ni on 8/4 cathode surface

16 gr — thick some Ni all around 2 amps -

I now neutralize 2 gram Cell - took over 2 Cubic inch bottles like Ni(OH)2 to neutralize showing Ni Anode Very low Efficiency

Must have plated out 15 @ 17 grams Metallic Nickel from each cell —

409 - 1 Hour 250cc Nickel Acetate 6 grams Solution Acetate, Neutralized
Very adherent black deposit scrapes off with knife in fine thin scales —

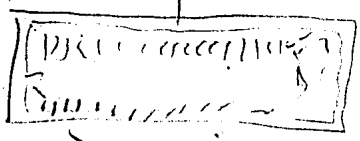
408 250cc Nickel Acetate 1 Hour — 6 grams Diphenyl Acetate. All cracked & peeled NG

Note →

12th Run Dup 87—

12½ gr was neutralized on 7th run
2 gr on 11th run - Then no further since neutralizing

2 gr All split & Curled up around the Edges



Rollers

Neutralized it with Na Carbonate

4 gr Came loose in Solution. Considerable Na placed at bottom end — some at 2 Top Edges flat, fairly thick

12 gr Perfect plating flat seems quite thin,

16 gr — 2 Edges turned up a little, Same thickness as 12 gr—

Now for 13th Run

See 1st Expt

One of Expmts given LOCC —

Solutions 1B 2B 3B 4B 5B & 6B
all on at 5.25 am.
400 ma —

	acidity original sol	cc of NaOH 0.1		grms free H_2SO_4 per 100 cc acidity
1 B	off after	1	Hours	0.2519
2 B		2	"	0.4534
3 B		3	"	0.9068
4 B		4		1.0076
5 B		5		0.9572
6 B		6		1.1083

4 & 5 B tried again to check

5 B Cracked along sides - lifted at top - nearly flat,

4 B — Ckd at Edges top curled up - flat, not so bad as 5 B

3 B Not cracked on sides but turned up bottom Ckd & turned up

6 B Cracked along Edges lifted,
This is about as good as any of the above Very soft - if it had been Clemsch would be ok

OVER

[13]

2 B.. flat. ok but lifted away all around Edge -

1 B - Cracked lifted - no better than the others

Evidently This solution is no - probably because it started neutral - Evidently good plating is only possible in good acid solution

---

Petersons cut flake before separating has 33% of lead in it - He is using the old peroxide on P pole trick
Cu 0.072%
Pb 33.63%
These samples brought over by Dholos, Sep 25th 1919.

Petersons separated flake has 0.68% of lead
0.23 Copper
another lot 0.93

13th plaining 87 - 10 deep

12 reload gr on 7th 2 gr on 11th

12 gr one side whole length
Curled up otherwise OK

16 gr Nearly OK Two Edges
turned up a little - 1/32 along
Edges lifted - slightly warping
flat generally OK

2 gr flat surface has specs
turned up 1 top Edge a little
& 3/4 shows little scalopping

4 gr - OK except 1 Edge
turned up slightly

Req flake brot over by chalcs
2½" bottle. 6" high —

Seperated very heavy books
by floatation. These averaged
12 flakes to a book —
Weight 0.5040

a second seperation obtained
lighter books, average
about 4 —
Weight — 0.1140

Balance which was
single flake with occasional
2 flake book —
Weight 4.987

Total 5.605

12 flake books 9.18%
3 " " 2.23
11.41 %

Flake

The more experience I get the more necessary do I find to have the solution very acid with Acetic —

A very good sol is 1/2 saturated $NiSO_4$ – 250 cc $2\frac{1}{2}$ cc $CuSO_4$ + considerable excess acid – acetate nickel

I am not sure yet if saturated or 1/2 saturated $NiSO_4$ is best both having same Acetic acidity – of course 1/2 of 6 gms acetate Ni

The apparent advantage of a dilute solution is that even when $NiSO_4$ is 1/2 saturated there is more Ni than necessary whereas the strength of $CuSO_4$ is just 1/2 + therefore does not disturb Ni plating as much —

Results 13th Run 87

2 grms bottom + 1 top Cor
lifted — nearly flat,
good plating

12 grm Perfect, OK

4 — flat bottom Cor
lifted very little, flat,
OK plating

16 grms OK. only left
1 Corner

Nowgoes to 14th plating

By using Conc $NiSO_4$ —
6 to 8 grms in 250 cc of
$NiSO_4$ of Acetate Manganese
deposits on Anode Light brown
peroxide now reversing +
make the Anode a Cathode
Nickel plates on but without
the Ni is tough & Contracts
+ breaks MnO_2 away
Must be our req 250 cc

C41J

Sept 26 1919

of $NiSO_4$ Conc 6 gr Acetate Nickel + 6 & 8 grams Manganese Acetate + some free Acetic acid at then works fairly well —

125 CC Conc $NiSO_4$ — 125 CC water — There is in the 125 CC of $NiSO_4$ 3 grams of Acetate of Nickel + a little $CuSO_4$ — How much Can say probably 2 to 2½ CC of Conc $CuSO_4$ As we know now the necessity of free acetic acid I add 10 CC of glacial which is pretty strong acid.

27 Cycles best yet but Ni is full of fine warts, + this is the Limit probably 16 cycles Commercial —

C1433

Flake →

Sept 26 1919

We are now going over all our old $NiSO_4$ solutions with various chemicals in them & adding to each 5 cc of Conc Copper Sulphate to each one & plating Nickel out on our 2" surface Cathode in presence of this Copper. which generally has a very bad effect on the Nickel plating most of them show very bad plating in 15 to 20 minutes at 200 ma Hours –

So far 274 – 6 grams of Citrate of magnesia has gone 1 hour & the plating only shows slight dark tint This would probably give 60 cycles for Flake Its behavior is remarkable However in 1 hour it shows fine warts under Microscope & would be no good probably 40 min plating was good

124. 6 gr Manganese Acetate has gone 1 hour + its just as good as 274 Except it is much darker it has isolated warts much larger than 274 + blacks specs I noticed that when 274 was very bright + good plating 124 had a dark tint,

I removed 274 + found it very brittle Top 1/2 stripped off Couldn't get bottom 1/2 off — its too brittle to be careful — The warts I notice are knobs + not spongy like 124 — Think this solution can be doctored —

On diluting 274 with water to 300 cc + put in automatic bath — The first plating of Ni was very bad — Here dilution was bad Run this down, 25 cycles looks fine — flat, flexible —

Fuellers work

Is this Cerous or Ceric Sulphate.

Note

Very promising

Note The Auto bath has 500cc so that when a Reg 250cc lot is put in bath there is 250cc water added —

Flake — 5cc CuSO4 in old solution
129 — OK for 20 min —
then started dark —
its splits along Edge —

271 = 5cc Cuboy 5cc free Acetic
1 hour 1 hour 13 min —
cracked early along edges but pretty good plating for 40 min
off 1 hour 13 min — surface very fine warts + the limit

No 2 — Sulphate Cerium 6 gr
This has been on 1 hour
+ bright good surface under Microscope it is starting to show very fine warts with the start of black spots on top of warts I think this is best yet in fullers solution think these warts would not appear —
1 hour 6 min I looked at it.
5cc Acet. 5cc Conc Cuboy no accelerator
OK at 1 hour 30 min good grain some Nodules top

Note →

125 6 gms Benzoate Manganese
45 mins, no water good surface
bright. Lots float stuff on vol.
Water runs from the plated
surface — This is best
surface so far —
has 5cc Conc $CuSO_4$ + 5cc
glacial acetic —
Evidently Benzoate Mn is not
very reliable —
40 minutes OK —
1.21 Hour 35 mm dark + warts
not good — 40 mm Limit

NOTE

So far # 2. Conc $NiSO_4$.
6 gms Sulphate of Cerium
best. 2 hours at 200 ma
when got black knob wart.
Think there are built up
specs + would be absent
in a highly filtered solution
Will dilute the 250 cc to 500
+ put on automatic
Has in the 250 cc 5cc Conc $CuSO_4$
+ 5cc glacial acid acetic —
not sure about acetic but think so —

136 — Fair

Gall wants a good water proof Material to stick a .005 Nickel stripping onto a plating disc i H2 uses Celluloid on face & then Beeswax over matrix lays this face on Celluloid & platten puts in press & heats under pressure

Jolual Cumarone resin works but there are infiltrations & Cu around Edge plates on matrix in Epoxy & Other Beeswax used to much bubbles But Beeswax has an oil in it & this gets on surface of bath & causes Cain with plating

I make the following suggestions

1st Get Gutta Percha Tissue
lay over Celluloid 2 or 3
sheets then put on Matrix
then heat & press —

2nd Pour liquid hot melted
White Carnauba on matrix
& spread —

3rd Use Balata sheet,

4 — Look up old book on
Shellac & select a very
low MP combination of
say Bela Kapilal & Shellac
which adheres to duck &
softens at low temp —
~~On~~ & while Melted pour
over Matrix —

5 — Shellac & Trichlorophenol
do its neither hard at
and temp but can be bent
for pouring on matrix or
make sheets by pouring
on tin foil & using these sheets

6 = Rosin base Melted with
Either White Ceresin
Black Ozocerite, Parafine —
etc —

In fitting Leclanche battery
Copper Electrodes Malgamed
together, I find by marking
the dry Cu 160 nickels
with Conc Sulphuric that
if heated to drive off the SO_3
that it looks it hard,
& seems best yet The Conc
Sulphur does not attack
the metals, find out proper manipulation

Increase driven size $2\frac{1}{2}$ times
this will be about 15 min to
a cycle
Also try — 1st filtering solution
Continuously to see if it gets rid of
Dearts & black specs
2 = If it dont try the Dimroddie
Dope used in Cu baths — use only
2 mlg at first & then gradually
add 1 mlg at time

Sept 28 1919 —

3:- Can use a Nickel plated iron Can for filtering or Hard rubber square box —

4) Move the apparatus in balance room so 6 Cells can be used in series —

Regarding Lelande CuO plates H_2SO_4 Conc or even 50% seal works — After heating to 1350 for 4 hours there is still some sulphate left. The plates can be put in hot water + all the $CuSO_4$ leached out before putting in NaOH,

Try Rosin in Alcohol also in powder also in Volatile Oil like Solvent Nap, etc — On heating Rosin forms a Resinate of Copper this is then burnt out in time at 1350 with hot air — Oleate also —

Sept 29 1919

Try Ammoniated Cu —

Our Reg seperated Nickel flake has no lead has 0.325 % Copper —

For fastening .005½ Nickel record on to holder for backing up with Copper in plating bath. I find Rosin with Stearic acid is fine low MP + Viscous + sticky — am determining best % of Stearic —

Stearic acid added to Rosin + melted has a remarkable effect in changing its character. a very small % of Stearic melted + poured out leaves the alloy permanently liquid of enormous Viscosity Can be pulled out in threads

Sept 29 1919

With 10 parts Stearic to 100 Rosin its can be bent at old Temp with 100 Rosin 20 pts Stearic its semi hard & flows like Tar in the sun, not brittle & can be drawn out in threads with 100 Rosin 40 Stearic its a perfect imitation of Beeswax The 1st 2 are Rosin Color with 40 stearic, its dirty white This is probably best for gall to stick on disc: on plating holder ——

I have just tried as a binder 8% Rosin in CuO Delaude plate to fit together it appears to be OK & burns away leaving a good fit —

262 - 250 cc $NiSO_4$ 6 grms Na Bichromate no deposit takes place in several hours on Cathode —
put 6 grms Acetate Ni in 6 ol —

Sept 29 1919 —

1 gram Copper bath dope to 125 cc of water — This is strength of solution put in Copper baths —.

The old solution 30 Litres of Conc $MgSO_4$ with 32 grams of Acetate of Magnesia per Litre. has been working for two weeks night & day. We have just removed it from the bath It has given us with pure M Anodes 38 full size dep moulds. 005½ thick and perfectly Malleable laying flat when delacked up to 30 after that it got harder & started to curl up until the 38th coiled itself up in a roll.
As the use of Magnesia Salt of Acetic would cause the removal of the whole of the solution to remove the Magnesia We are

Replacing it with 40 litres of Conc $NiSO_4$ & adding 32 grams of acetate of Nickel which work even a little better. Any free H_2SO_4 immediately displaces the Nickel from the acetate freeing the acetic acid which keeps the solution neutral as far as H_2SO_4 is concerned but very acid as far as the acetic is concerned. Acetic has but little effect on the Nickel deposited to diminish the Efficiency, + by keeping the Sol free of H_2SO_4 beautifully Malleable nickel is obtained. When the solution gets too acid (12) Acetic Ni hydrox or Carbonate is added to bring it back nearly neutral reforming Nickel acetate rendering it unnecessary to remove the Solution,

301 Acetate Manganese
Pretty good — 5cc CuSO4
5 cc Acetic acid —

301 — 200 ma —

1.7 cc CuSO4
5 cc acetic acid
2 gms Acetate Mg
80 cc MnSO4
Made up to 250cc
Went 7 hours pretty fair
but too many nubs

17 hours nickel based panels fairly
bright 90% is fine grain & OK
balance only wants to break
down out

Evidently 1.7 cc per 250 cc
is OK — with 1/3rd the
MnSO4 that a Conc MnSO4
250 cc has —

With the 1 Reg Rubber
bath with felter that
gall has been using a
which 30 .005 ½ malleable
nickel discs have been
plated 7 amp 10 hours
Each containing
24 grms Magnesium metallic
per litre, 35 litres —
There was about 3 or
4 oz of mud caught in
the felter cloth bags
This was almost entirely
~~ferrous~~ ferric hydrox
probably comes from rod
holding disc holder & from
anode which is said to
be CP nickel & probably
from elsewhere —

Phenomenon
37 = Saturated Sol

Bromate of Nickel
5 cc $CuSO_4$ 5 cc Acetic
Plates Copper out instead
of Nickel — good Cu plating
bath still — 240 ma
per 2"

For 78 Ni baths, 450 galls
leaving 115 gals Excess

Requires 60° Fahr —

1852 lbs $NiSO_4$ 6 aq —
335 gallons water ? ~~will~~
~~determine this accuracy~~ ok

90 lbs Acetate Nickel —

~~Starting 20 baths instead~~
~~of 78 | 78~~
~~Bath of requirement~~
~~about 115 gals~~

Latest,

387 – plated Ni out
Off for 3/4 hour –
with 5 cc $CuSO_4$ in –
to Camphorate Soda –

20 baths
474 lbs $NiSO_4$
86 gals water
22½ lbs acetate Nickel

This is theoretically
saturated –

But it may crystalize so
I will increase the water

474 lbs $NiSO_4$
95 gallons Water
22½ acetate –

This for 20 Baths,
Spec grave 1.362
should be
with 86 gals water –

3

I removed the Ni from Drip 87
Run about 35 @ 40 hours
250 cc Conc $NiSO_4$ —
4 grms Nickel acetate,
after dripping
Weight 9.900 grms
flat, 2 sqr inch.
Think I was 200 or
300 ma probably later
still — on & off at times

This is Malleable
Excellent,
only round low knobs
no points sticking out

I rolled this out 3 times its
length without heating its
still soft & didn't crack
Except where lumps at Edges
flattened — FINE
Its in my Desk in Library

Flake plater

250 cc Fluosilicate Nickel
15 cc Acetate Copper Conc
Deposits in auto flake black
Copper deposits over Ni
dark red NG —
There has always been something
wrong with our fluosilicate
although its beautifully
Crystallized —

flake plater

250 cc Conc NiCy KCy
15 cc CuCy KCy —
Plates — This deposits
Copper at 20 Ma or 200
Ni dont deposit at all —
Cu deposited is very good
The Nickel wouldnt plate out
Even with 500 Ma —

436 = flake tester

250 cc NiSO4 20 cc CuSO4 Conc
8 grms Mg Acetate.
Dark Nickel too much
Copper — I now put in
15 cc Acetic — No Better NG

429 - flake plating

250 cc Nickel Acetate
15 cc Cu acetate
both saturated, 1st deposit Ni
not bright has streaks from
specs - Copper dull

Now add 10 cc of Acetic
acid (glacial) -

Nickel dark no improvement

---

430 250 cc Ni Acetate flake plating
15 cc $CuSO_4$ Conc
Dark Nickel - no

Aug 27 Experiments in Progress + finished

1 = Improved CuO plate, Expmtg

2 Ford starter battery - Hanley Burns
Kircher Edison.

3 Audion storage battery Edison

4 Regeneration to sulphates of the Copper + Nickel carbonate by-product from storage battery, Doughterty - preliminary Expmts done

5 Rapid Copper plating - Edison

6 Rapid Nickel plating, Soft finished

7 SMG + Chalko.

8 Seperation old cell mix into $Ni(OH)_2$ + useable flake Edison

9 = New blanks for Disc, Dally + Dunwiddie nearly finished -

10 Automatic Varnishing Disc blank

11 = Long funnel recording for disc Exptns Edison, W Miller

12 Dam power in flake plating and improvements to cheapen

13. Utilization of waste flake Ni. Off from factory Edison

14 Substitute for some or all the hard rubber parts of SBat to Cheapen. Edison

15 - Extracting Lithia from ore process Edison

16 · XYZ Exptns Edison

17 Process for seperating Ni + Cu by roast + magnetic on Sudbury ore

18 Mfg sheet Ni + Co by Copper sheets + 8/4 Edison

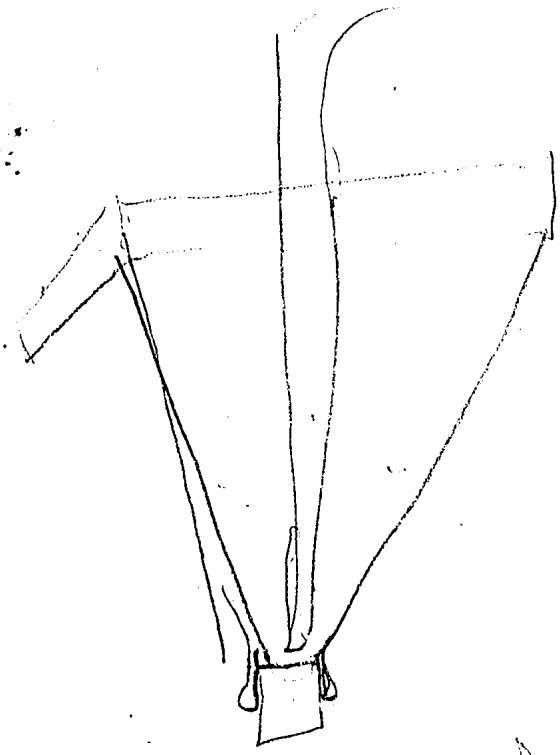
19 - Removing Ni from working Moulds

C1913

Sept 10 1919

~~Following gave negative~~ Nickel from 100 ma per cmch
~~of Hydrogen 4 OK 1 hour~~

	1 Hour	3 H.
Boric Cu	OK	no



Wolfenden

[ITEMS(S) FOUND IN BOOK]

10/2/19

Mr. Edison :-

A saturated solution of $NiSO_4$ at 22°C (practically room temp) shows Sp. Gr :- 1.362

and

1 Liter = { Water 744.2 grms
$NiSO_4 + 6Aq$ 493.0 "

1 Gal = { Water 2817. grms
$NiSO_4 + 6Aq$ 1866. "

and to make up 450 gals will take

Water :- 335 gals.
$NiSO_4 + 6Aq$:- 1852 lbs.

901.2 lbs Nickel Acetate should be added for strength of 24 grms per L

Notebook Series -- Notebooks by Edison
Notebook, N-19-10-06

This notebook is a continuation of N-19-09-09. It was used by Edison during October-November 1919, primarily for electroplating experiments performed with various numbered solutions. Many of the entries refer to nickel and copper plating of flake for use in storage batteries. Also included are notes on disc record manufacture and the electroplating of master record matrices. In addition, there are entries describing experiments on the regeneration of flake from old battery cells, as well as a few experiments with primary batteries. One entry indicates the amount paid by the Ford Motor Co. for two different makes of automobile starter battery. As with preceding books in this series, this notebook offers evidence of the convergence of Edison's interests in battery and disc record manufacture resulting from the electrolysis involved at various stages of production. The notes indicate that John McMullen and Frederick P. Ott assisted Edison. Inserted into the book is a communication from E. E. Dougherty to Edison regarding disc molds. The front cover is labeled "No 5 General Book October 6th 1919." The pages are unnumbered. Approximately 80 pages have been used.

1 Liter 20% NaOH.
dissolves 170 grms of metallic
Zinc in our battery
under practical conditions
(not theoretical) —

Oct 6 1919

432 = 200 cc Nickel Chloride
150 cc Water 15 cc Copper
acetate Brown Ni deposit
Copper ditto NG
200 ma Ni 25 ma on Copper

Selenic acid neutralized by
Soda deposits on Copper anode
100 ma — Selenide Copper but
it dont show anything on
Nickel anode — in fact
Ni Cathode shows a darkening
while the neutral NaSelenate
didnt attack Cu, only
Current at anode dissolved it
yet after 30 secs I taken
off it Colored Cu by
Immersion slightly —

Deshaies Ni is Coated at
Cathode by action of Na
metal on Cu Anode
by direct decomposition

437 - 125 cc Magnesium Sulphate
125 cc Ni SO4
10 cc CuSO4

Started off fair - got 3 or 4 cycles - OK - but 1st cycle bad - but caused strip a little
Stopped Strip with only 4 cc CuSO4

No 2 Best yet 274
next for flake -

439 = 250 cc $NiSO_4$
16 grams Magnesia Sulphate
8 " Nickel Acetate
5 cc $CuSO_4$ —

This starts off well, got 2 layers Nickel on but no Copper found had not put the Copper in now in —
This is a Variation of 437 with ½ the Copper in — + works much better, — 20 Layers — too wavy
Possibly Can improve this by dif stirring + perpendicular

438 — 250 cc $NiSO_4$
16 grms Manganese
5 cc $CuSO_4$
Dont work well — Charong Experiment —

Recp of 438 — Except Cu left out + Cathode made anode to deposit MnO_2 but it Took Ni off the Cathode metal —
Now dilute it ½

(5)

NOTE

164 – with Cu acetate in pretty good + bright for one hour
Says Chlorate of Cobalt 6 gr
doubtful

425 – with Cu acetate
fair for 1/2 hour
Magnesium Butyrate 6 gr

440 250 cc $MnSO_4$
10 grms Manganese Acetate

Dont deposit MnO_2
beet Curls in ok + attack
varnish no.

426 — 5 $CuSO_4$ 5cc acetic

Went cooked for 1 hour

250cc nearly saturated

Cobalt sulphate —

Oct 8 1918 —

For flakes — So far good ones are —

402 — 274 — 125 — 136

301 387 —

All 250cc $MnSO_4$ — 5cc $CuSO_4$

6 Citrate Mag

6 Cerium Sulfate 1c or ous?

6 Benzoate Manganese

Acetate Magnesia

6 Camphorate Soda

Oct 8 1919

Plating Ni first I found black spots — Plating Cu 1st OK + no black spots or Trees —

Stirrer behind Cathode + 1/4" from Anodes

(110)

When I plated Copper 1st Cu OK perfect,

Ni on this dark + very bad shows trees around Edge —

I now repeat this with Cathode which is only cleaned no 8/4 film —

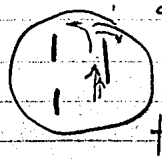
Copper Plated 1st,
Ni 2nd —

~~just~~ not quite so bad but trees bad at Edges + black streaks —

I now add Considerably more of Dimmoddie Dope —
Copper 1st —
Most of the Ni is now very bright but Req fine trees at bottom edge + upward shanks about up 1/2 way top part OK — There are only 1/2 doz specs in main part — No 8/4 —
Trees but small —

I now add Considerable more Dimmiddie dope
1 No 8/4 — looks as if gas adhered + started a spot + plating thru gas there wasn't Enough metal in Sol. —

If this is so then Current of liquid must pass face of liquid so as to detach bubbles + not force liquid against face which tends to force bubbles tighter



this would explain why hand stirring between Electrodes by glass rod gave best results -

All black NG -
Thrown Sol away

We now try

442 = 250 cc NiSO4 Conc
8 grms Acetate Ni

4 cc CuCl2 Kcy - big precip -
Nickel deposit OK Curls up No Copper deposited - probably precipitated all out -

flake -
This is old No 2 - with more Cerium Soy - 250 cc NiSO4
10 grms Cerium Sulphate (Cerious) -
Cu very thin - Ni darkish but no trees has streaks dark but Micro shows OK

Immediate Dope dont work in plating flake from Cu & NiSO4 mixes +

In flake process the Copper in most solutions plates out OK no trees 5 cc of Conc CuSO4 — 12 minutes, in 250 CC Conc NiSO4 — Its the Nickel that trees + is bad.

If the surface is even + smooth tree'ing stops, but if pinhole like record grooves streaks go upward from Edge of grooves also bottom, starts from Varnish where there is a spec on Varnish Undoubtedly adhesion of gas is trouble for streaks + tree'ing — Remove gas + all will be OK

These are Solutions from tests for Malleable Ni plating - ammonia used with 5cc $CuSO_4$ + 5cc Acetic acid to see how Ni plated out 100 ma per sq. in of Cathode

164 — ½ hour fair

272 "

204 "

272 - "

77 1 hour

118 ½ hour

300 ~~[illegible]~~ hour

77 - " 4 grams

77 " 8 "

78 ½ h

387 3/4 hour

303 1/2 H

78 overhour

303 - 1/2 h

210 1/2

118 1/2 H

301 — over H

2 overhour

125 overhour

124 "

Oct 9 1919

At last we have found out how to prevent new flock clay denser from blank from sticking to blank mould Instead of heating 5 min in press & cooling 15 we heat 2 min & cool 8 min — This makes a blank strong enough dont Cook linseed Rosin out so it sticks & at same time makes blank more porous for clinching the varnish

The small Harding Mill Capacity is 400 lbs hour 1st pass then 2nd pass 200 lbs hour —

3 6' ft Mills 16 long will give us 700 lbs blanks 20 hours

Oct 13 1919

Flake plating = With 250 cc
Conc $NiSO_4$ - 5 cc Conc
$CuSO_4$ - 6 grms Acetate
Magnesia Copper plates
out OK & with 10 ma
Cu 200 Ma Ni got 22
perfect cycles

Then made some CP
Conc $NiSO_4$ free of iron
& also CP $CuSO_4$
250 cc $NiSO_4$ - 16 cc
Conc CP $CuSO_4$ -
5 grams acetate of
Nickel instead of
acetate Mg - found
Sol was much higher
Resistance had take off
Leads & put back
1 Edison SB cell -
10 ma no copper plated
out, Added 5 cc more
of $CuSO_4$ - when Copper
plated out

Evidently every solution has its specific peculiarities & will have to determine which sol gives the maximum number of perfect cycles —

There was one change we made however that we didn't have in Mg Acetate Cell —
This is that we plated the whole face, 2" high + over the Edges + we may have had more than 2" area but I think not —

We couldn't get but small amount Cu so added 5cc more $CuSO_4$ total 11cc $CuSO_4$ —
The Copper now plates out OK — 8 Cycles shown under reference that — that no Cross + Edge

Ok but whole Evangelchem has little float Cupola mounts & not hurting separation of flake as there will be no Clinching —
Have it running to 16 Cycles to see if these mounts will get worse or they will Clinch — 16 cycles little domed swellings larger than with scapers but stuck OK
see next page

Note Congo scapes is not blued green by Concentrated acetic acid — 1 cc in 500 cc water of 50-50 H_2SO_4 just blues it but not dead blue —
This is worth to know

We now let it run till 615 pm making 24 cycles.
After 24 cycles — its OK + little domes increased a little more in heighth, Edges OK
Think flake would seperate OK —
We now let on stay till 9 pm
This will be 36 layers but think it may clinch
No sign of trezing —
The top Edge simply rounded thick — rounded —

When this solution gets older it will be better of
Copper dont change as of notice a slight Crack near top Edge where it turns around sides + also Edge lifted up slightly showing Hydrogen in it —

The 36 layers up to 9 o'clock last night & taken off by Fred — also the other one put on at 9 pm & taken off at 6 am.

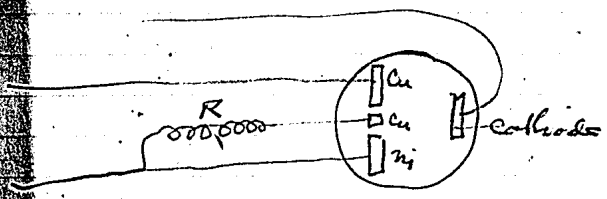
Both had 36 cycles

The all night one had lots trees cupolas not so bad as first one showing that putting the stirrer close to Cathode is an improvement it almost prevents the hills showing that they are largely due to clinging Hydrogen bubbles —

Results, Reciprocating Stirrer Close to Cathode is best way to take care of Hydrogen bubbles the closer the better

2nd That the Rolled Copper anode is not

100 % efficient + that means must be had to keep copper content of solution constant,



I do this by using a small Cu. anode connected to the Ni anode thru a Resistance R

10 ma on Cu for 12 min.
10 ma on small Cu when Ni is only 3 minutes –
will satisfy ~~that~~ an efficiency of only 75 % on Reg or Ream Cu anode

We must find out by Experiment what the Efficiency + Correct it by Extra Cu anode –

Oct 15 1919

Finding that 10 ma dont plate Enough Cu out + to make the ma seconds for Cu + Ni the same as D Bat Co use per inch WE slowed down the plating time to 33 minutes per cycle + 10 ma on Cu 210 ma on Ni + 10 ma on extraordinary Cu anode Connected to the Ni anode thru Resistance,

First cycle showed fine plating both Cu + Ni

Sol 250 cc Conc $NiSO_4$ Purified
6 grms Acetate Sodium may be diff.
6 cc Conc $CuSO_4$
Reciprocating Stirrer 3/32 away from Cathode

20 cycles - full nuts on surface + out lower edge 1/2 doz tests as a whole it is fair + probably 3/4 flake will seperate - Not Enough Copper as Ni plating been too much

I do not have any success in plating out Nickel from a Cyanide of Ni & K with + without a little Cu Cy Kcy. in it —
Unpromising.

180 CC Conc $NiSO_4$
72 grms NaOH
54 " Sodium Citrate
Try plate Nickel
The above plates out Nickel fine — But its not Nickel dissolved in alkali as its neutral — if NaOH added it goes solid A.
This only deposits a blush of Ni in 6 hours NG

A Tartrate Sol which is very alkaline does not plate out any nickel
It underruns the varnish + gas forces it one side
Anode very black, tenaciously adhere, NG

I find that in putting in the annex Copper Anode I didnt allow for the loss of Copper from the bath due to Ni plating — I am now putting 30 ma to the Cu annex instead of 10 + Raising Ni to 230 Ma thus keeping Ni at 200 Ma — This should supply the Extra Cu to bath taken out by Ni plating, its a guess of course —

Nickel Carbonate, reduced at 1000 Fahr by Hydrogen looks dense, preserves original form, on Carbonate Loose powder —

Flake plating

454 250 cc pure $NiSO_4$
6 grms Acetate Magnesia
6 cc Conc pure $CuSO_4$ -

Started to tree at 6 cycles
Removed Cathode 9 cycles
Black & NG.

The 3 tests are doubtful
will make them over again

Acetate Ni
" Mg
" Soda

In addition I will make ~~[illegible]~~
Citrate of Lithia —

Tests made over Flake 2 cycles per hour

10 ma Cu. 230 Ma on Ni but 30 ma of this goes to anneal Cu anode -

456. 250 cc $NiSO_4$ -
6 grms Acetate Soda
6 cc Conc $CuSO_4$

1st Cycle - Copper very poor thin deposit see the Ni in spots Abandoned - it may be its oxidation, NG may want acid

Here is a fine experiment
2 Hours at 200 Ma – 2" ogr
Made 6 Cells. 250 cc $NiSO_4$.
8 grams Acetate Nickel –

1 Cell	no glacial	Acetic
1 "	3 cc	"
1	6 cc	"
1	10 cc	"
1	15 cc	"
1	25 cc	"

As the acidity increased the grain

~~I now doubled the glacial~~
~~The 3 cc was raised to 6 cc~~
~~6 cc " 12~~
~~10 cc " 20~~
~~15 cc " 30~~
~~20 cc " 40~~
~~The 25 cc when no more put in precipitated a lot by diminishing solubility — stirred it up & poured out 1/2 the sol. added water to bring to 25 cc~~
~~30 cc very fine 2 or 3 black spots 40 ~~[illegible]~~ ~~[illegible]~~ finer than 30 cc no black spots Think conc. H_2SO_4 dir. [illegible] not so good as 1/2. that strength as viscosity of strong acid holds bubbles against cathode~~
~~25 with 25 cc — that precipitate [illegible] sight [illegible] the [illegible] [illegible] no [illegible] [illegible] [illegible] amount of acid [illegible] [illegible]~~

of the surface got finer. the surface without any acid was coarse. 5 @ 6 times coarser than 25 cc —

15 cc shows under micro a few black spots, round, seems as if gas bubbles cling 25 cc considerably more black spots. These spots not noticable at a glance

In any event 10 cc is OK

+ possibly 25 cc if solution has a reciprocating stirrer or cathode is a cylinder + rotated high speed. The 25 cc grain is exceedingly fine

Smells strongly of acetic acid
(12) the gas from Cathode -

Incidentally note fine quality of plating
Deposit with only 1/2
strength $NiSO_4$

I used non stripping
Cathode so can't say
if tough will try
this again with
stripping Cathode

Also there was a lot of bubbling
on gas coming off Cathode
& some on Anode - May come
all vanish later - think not

Oct 17 1919

Here is another Experiment

125 cc Conc $NiSO_4$
125 cc Water
4 grams Acetate Nickel
No acetic acid.

Ditto	6	acetic acid glacial
"	10	" I dropped all this adding 6 grms more acetate Nickel only
"	15	" change to that
"	25	" 6 + 10 are finer matte, + is an improvement all round
"	40	"

No acid Even - Strong Matte
6% acetic Even but Coarse matte
10 " finer matte
15 " still more finer matte
25 " Very fine matte
40 Almost smooth but a shade Matte,

The law may be stated that in $NiSO_4$ in presence of Nickel acetate the smoothness of the surface increases with acetic acidity up to 180 cc per liter of solution

The set of Cells 250 cc $NiSO_4$
8 grms Acetate Ni
0 3 6 10 15 25 –
after 1st test had the acetic
acid doubled –
6 12 20 30 – but the
25 doubled to 50 precipitated Salts by
recession of Solubility
I stirred it up & poured
out 1/2 adding water to
bring to 250 cc This cleared
it –

The plating on all got
finer as acid increased,
30 cc showed few black
spots, But the 50 cc acid
diluted 1/2 shows perfect
& fine –

It looks as if $NiSO_4$
should not be conc as
viscosity holds bubbles
on Cathode,

for flake think 200 cc $NiSO_4$
50 cc water 8 grms acetate/L
and 10 cc Acetic acid best

Oct 17 1919

455

250 cc $NiSO_4$ Conc
6 grms Lithia Citrate,
6 cc Conc $CuSO_4$
230 ma on Ni of which 30 goes
to Aluney Copper anode
Concealed to Ni anode
10 ma on Copper
2 Cycles per hour

10 Cycles good - Some spots
no deposits other parts
moundi — No bras + will be
OK flake —
Wants free acid + some
dilution of $NiSO_4$.

It will be seen that this is
very much better than acetate
of Nickel —

Flake 18 Oct 19

457 – 250 cc $MnSO_4$
6 grms Acetate Magnesia
6 cc Conc. $CuSO_4$

Dont plate Copper good
no better than Acetate Soda

Only Citrate Lithia one of
this series is good –

Flake

175 cc $MnSO_4$ 75 Water
5 grms Nickel Acetate
6 cc Conc $CuSO_4$
8 cc glacial Acetic

Dont deposit Copper
good scarcely any
Can see 8/4 +

NG
is it the acid

Oct 20 1919

6 Cells. all ok plating

#1 200 cc $NiSO_4$ 50 cc Water
8 grms Ni Acetate –
Coarse matte, otherwise ok

#2 150 cc $NiSO_4$ 100 cc H_2O
8 grms Ni Acetate
finer matte than #1

#3 100 cc $NiSO_4$ – 150 cc Water
8 grms Ni Acetate
About same as #2

#4 – 75 cc $NiSO_4$ 175 cc aq
8 grms Ni Acetate
same as 3

5 50 cc $NiSO_4$ 200 H_2O
8 Ni Acetate
Quite fine matte

6 – 25 cc $NiSO_4$ 225 Water
8 Ni Acetate
Shade finer Edges show thickening
+ rounding in hills – exp of gas

I now add 10 cc glacial acetic to each cell of the cells recorded on last page having various proportions of coagulator —

#1 fairly fine walled fewer than without acetic acid

2 finer.

3 same

4 same — perhaps little finer

5 about same as 4

6 about same

Not much dif in all except 1st one which is coarser

Here appears a case where increased Viscosity brought warts from gas clinging

6 Cells

125 cc Na SO4 ... H2O

125 cc Water, ... acetic

20 grms Na acetate No acetic

has warts, Coarse matte shows streaks Very Tough.

ditto 6 cc acetic

warts, Coarse matte, streaks not as Tough as #1

ditto 10 cc acetic

warts not so bad fine matte No streaks - Tough

ditto 15 cc acetic

warts just as bad as No 1 No streaks - Edges turned up

ditto 25 cc acetic

not turned up warts same - no streaks

ditto 40 cc acetic

warts -

None of these are good on accounts warts matte -

last 4 are thinner than 1st 5 Warts but no 1 by Excess Na acetate -

Viscosity increased holds bubbles

Resume.

Warts surfaces domes semi circular seem to be due to gas clinging, diminishing viscosity of the solution diminishes the size of warts & when viscosity is low there is none & when very low viscosity matte surface is exceedingly fine grained

460 —

I put up 6 Cells with $CuSO_4$

#1 250 $CuSO_4$

2	drops	6 cc	acetic
3	"	10 cc	acetic
4	"	15	"
5	"	20	"
6	"	25	

All coarse crystals, 4 showed a smut
5 showed considerable smut & bubbles

6 all full of circular holes where bubbles had clung thru whole of plating —

This acts just opposite of Ni Solutions

Added 6 grms acetate Cu to Each
+ Re Run — #1 streaks whole length + badly corroded at streaks —
others OK plating No bubbles in 6
but brown oxide in spots green on 6
green, sandy fine — Improvement but unsatisfactory

Make ucco Test

125 $CuSO_4$
125 Water
1 6 acetate Copper no acid

2 ditto but 6 acetic acid
3 ditto 10 "
4 do 15 "
5 do 20 "
6 do 25 "

perhaps more acid would stop them

All are bright deposits Coarse matte, No 1 has some Cu_2O at Edges.
2 bright - warts at edges
3 " " "
4 " " but literally covered with very deep bubble holes.
5 Worse in holes
6 full holes but not round

Blake

125 $CuSO_4$
125 Water
8 acetate Copper no acid

dito – 6 acetic
" 10 "
" 15 "
" 20 "
" 25 "

With square jar + Copper Cathode, 1500 cc Conc $NiSO_4$ + some acetate Nickel

2 hours 5 amp 48" inches sheet was. 9,780 grammes weight —

The second trial sheet weighed 7.150 grams

Then changed solution Removed 500 cc + put in 500 water + 150 cc Acetic acid Weight of sheet only 3.650 grams

Why

Must make efficiency tests see 2 pages ahead

Cu

125 cc Conc $CuSO_4$
125 cc Water
6 grms Cu Acetate in each cell –

#1 no acid. wants at Edges, blue at Edges, NG

#2 6 grms Citric, good color grain fairly fine, nubs at Edge & between grooves.

#3 10 Citric – less nubs

4 15 Citric about same
5 20 " one Edge discolored "
6 25 "
This has finer grain than any & less nubs –

Nothing promising in this Experiment.

250 cc Conc $CuSO_4$
18 cc Sulphuric

1 Drop Diuvid Dope / Milq in 75 cc
Coarse grain

2 big warts all over

4 very fine grain - warts less

7 grain not so fine Warts all over

12 nubs, warts - not so fine grain
as 7

20 Very long nubs, warts big

Nothing promising in this well
use same Cells + increase the dope
added more dope
25 37 45 60 75 + 100
drops - No improvement
note here that Edges had no
nubs which is curious, warts
+ nubs + filaments bad on
all — Very unpromising

We now run big 6X8 cell with same solution but 1/2 the density 2½ amp for 4 hours instead of 5 amp 2 hours as with all the sheets 1 to 5 taken off

It still gases very much notwithstanding low density

The sheet from 1/2 density only weighed 3.180 grams so low efficiency is not due to H from high density —

May be due to lack of H_2 We are now dissolving More H_2SO_4 in the solution to saturate it again & use 5 amp & 2 hours —

After that will heat sol to get eddy circulation —

20 Baths working in Disc worked at first on Metal OK but after ~~[illegible]~~ 50 digs out crack even on Metal Matrix had to stop — Whereas same solution in the small single bath works OK on both metal & Celluloid taken 37 plating off Spec'd around 1.1 to

Now the only difference we can see is that the small bath is 92 + higher whereas after adding coils around large Tank the Sol in baths are only 78° Fahr We will raise temp to 92 by adding more coils,

Also the filter press cloth & pressure takes out more Ferric hydrox than the little bath does as we use bag of thin cloth + only single head — Ferric hyd May play a part in it.

We just tested Sol 500 cc per inch of plating surface & 800 in small bath 21 [illegible] per inch of [illegible]

in the big bath I find spec G.
1.202 at lab temperature
This seems rather thin I should
for such a large quantity of
Solution, =

This is now most important
Experiment —

I am trying Effect of Fe_2O_3 (hyd)

250 cc Con H_2SO_4
6 grms acetate Ni
6 Acetic
+ Various amounts of
Ferrous Sulphate - this
will oxidize - & bath not being
filtered it will stay in as
colloid —

I find from Mac Mullin that while
the 20 baths are 78° Fahr
The temp of room is
75 - Therefore the heat is entirely
insufficient to meet

Conditions of the small Cell which works at 92 — Mac is having more steam coils put on + also both crocks provided with steam instead of one as now We must have 92 in baths plating —

Oct 25 = Steam coils ~~on~~ around outside of each big crock — They get 92° Fahr in all the baths by circulating heavier from washing face of disc + putting more thru the anode kept They filled the baths with fresh + report first not coming out all right a good The little bath 3 deep keeps working OK This is off from the 20 bath which wouldn't work but bottle + caused us to increase temp to 92 when it is OK

Oct 23 1919

Experts to determine effect of Iron on the New Ni plating sol

2 Hours per 100 ma inch and Temp

250 cc Conc $NiSO_4$
8 grms Nickel Acetate
6 cc glacial acetic
1 grm $FeSO_4$

1 grm - Central part mirror like, around edges matte but exceedingly fine grain

2 grms $FeSO_4$. Mirror like all over, no grain

4 "

6 " all edges brighter than mirror like Heavy, no cracks etc "

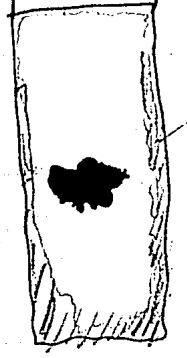
8 " Seems full hair cracks if they are crack "

10 " Seems fuller of Cracks

Repeating with stripping Cathodes + See 2 pages ahead

Note - Considerable reduction to Copper when #2 + 6 put

in Sulphate Copper Conc
after acidifying with H_2SO_4
whole surface of 6 turned
to Copper While No 2 after 1/2
hour was only slightly Coppered
at places



(+) Copper tint

2 gr

Evidently 2 grms $FeSO_4$ can be
used in 250 cc $NiSO_4$ with
acetate & acid a — get polished
surfaces without depositing
more than a slight amount
of iron —

No 5 was entirely
Coppered in 10 mins in
$CuSO_4$ neutralized.
SC

This gives me a new idea for flake
use 200 cc $NiSO_4$ - 50 cc $FeSO_4$ - 8 acetate Ni
10 $CuSO_4$ & some free acetic
deposit Ni 200 Ma on 2"
open circuit for 12 minutes
& let the iron deposited in the
Ni be reduced ~~by Cu~~ to Cu -
then plate again -

---

6 Cells - with 1 to 10 grams
Sulphate iron in $NiSO_4$ 250 cc
8 g Ni acetate 6 cc glacial acetic

When used on 8/4 stripping
Cathodes 1 gram $FeSO_4$
to 10 grams all were
horribly cracked & pealed
Even 1 gram very bad &
Cracking & pealing increased
with the decrease of
increase in $FeSO_4$

Shiny means brittleness
& Iron should be
elemental

This may explain why battery 1st starting is not so good as when older — at first there is appreciable amount of iron in solution. This gradually gets deposited with the nickel — finally all is deposited & Ni ceases to be brittle.

Running the 6x8 cell again. 92 Jahr only gave 4.750 + is no improvement by heat, gasing bad.

This runs it down to lack of acetate Ni. The Ni prove the acetate having been taken away by SO_3 due to low effcy of anode there being no more to neutralize the mineral acid, we get poor plating in presence of mineral acid.

We now take same oof neutralize it with $Ni(OH)_2$ + then add. 20 cc glycerol + Run 5 amp Cold —

Oct 23 1919

I have just sent over to Walter Archer some regenerated $Ni(OH)$ from old cell — used glucose + NaOH + it was deep green more green than Reg $Ni(OH)$ had a little flake + some black undissolved $Ni(OH)$ in it but not much say 10% —

Various Conditions Oct 23 1910

This Experiment illustrates how different Conditions affect Results —

100 NiSO4
100 glacial acetic
50 cc Water
6 grams Ni Acetate
Had to add 150 cc water to this to redissolve precipitate
Fine grain Matte no warts only good one of the lot.

125 Ni Nitrate,
125 Water
10 gram Sodium Sulphite
All green hydrox no metal
Sulfite didnt reduce the Ni and prevent attacking Ni metal —

125 cc Nickel Nitrate
125 cc water
10 grms Na Sulfite 10 cc
acetic acid
All trees –

125 NiSO4
125 water
10 grams Sodium Sulfite
Mirror all over
hair cracks running inward
from Edges –

125 NiSO4
125 H2O
10 grms Na sulfite –
10 acetic acid
Black trees, horrible –

In plating with 2" sqr Cathode on start there is no gas.
250 cc — This equals 125 cc of Conc $NiSO_4$ – 4 acetate Ni to inch Cathode, 125 to 1 + 4 Nacet

In 48" cell. there is 1500 cc but 48" 48-acet, giving only 31" $NiSO_4$ + 1 Nacet to 1 inch 78 or 92 Fahr no change

In the Single bath in Dura dapat that worked so well there is 45 inches + 60000 cc $NiSO_4$ + 960 grms acetate
Equals 888 cc $NiSO_4$ – 21 Nacet. per inch of surface 92 Fahr

Big 133 gal 20 Catho 900 inches [illegible] grms Ni acetate per inch + of $NiSO_4$ 546 cc To 1 inch
78° Fahr

It looks as if we should always have not less than 500 cc of solution of $NiSO_4$ per inch plated out & also 20 grams acetate Ni allated to above 500 cc for acetate for 1 inch surface at 92 or more Fahr

100 cc Conc $NiSO_4$. Conc and temp. there can be added when continuously shaken 23 cc of glacial acetic acid at which point crystals appear the temp is constant at 22° Cent until the crystals appear when it jumps up 5° Cent or 9° Fahr for 250 cc. the limit of acidulation would be 57 cc of glacial

There is enough $NiSO_4$ in big bath but only 1/2 enough acetate Ni allotted to each much There fore about 20 lbs additional should be put in if all the 20 baths are plating simultaneously $NiOH_2$ must be added to return legend so as to get on 40th Clothes to keep up supply of acetate Ni

250 cc Cu Acetate.
plating OK but Evenly black

ditto 6 acetic acid cc
black edges Middle red
grain fairly fine

ditto 10cc Acetic
streaks up — blue oxidations
sides, Especially Top

ditto 15cc Acetic
Peacock Edges,
Middle streaks + Red Cu

ditto 20cc: streaks
smudged sides not bad
Middle red & cept streaks
OK Cu

25cc Acetic sides OK
generally red Except
streaks which are bright
+ OK —
This is all oxidation —
H at streaks prevents oxidation
Ox, comes from wandering from anode

In the 6X8 jar made up
new sol
1500 cc Conc $NiSO_4$
48 grms acetate Nickel
25 cc free acetic
gassed bad
5 amp 2 hours –
Weight 7.400 –
2nd Dup 6.500.
Not right yet,

First sol was
1500 cc Conc $NiSO_4$
didnt record acetate Ni
or free acid got 9.780 wt
2nd trial 7.150 from same sol.

So in above solution I should
have put more acetate Ni
in as its only 1 acet Ni per
inch –

Make up another +
put in as much as it
will stand + same
acetic 25 cc
(Made)

Efficiency Oct 24 1919

Weighed Anodes & Cathodes

250 cc $NiSO_4$

2 4 6 8 10 12 grms acetate

Ni no free acid — 2 Hours 300 ma

First Trial results

after 1st Trial sol to be dumped with same sol but with reweighed Anodes & Cathodes

6 X 8 Cell.

1500 CC Conc Room Temp
$NiSO_4$ — 25 CC Glacial
Acetic —
Saturated at room temp
with acetate Nickel just
to Crystalizing out point
Took 60 grams —

gasis — 5 amp 2 hours

foil — Weighs 7.440
fine plating —

Holding sol for further
Experiment

Memo

Saturated Sol at 22 C room Temp
$NiSO_4$ —
Specif 1.362

$Ni SO_4$ sol 1 Liter
Contains 493 grms dry
$NiSO_4 + 6 aq$ and
744.2 grams water

Or

1 gal solution contains
4.115 grms $NiSO_4 \times 6 aq$
+ 0.744 gal water

1 Liter is 60% free Water 40%
Crystals $Ni SO_4$ 6 aq

There is 44.2% of water in
the $Ni SO_4 \times 6 aq$

100 cc Saturated has
77.68 grms free & combined aq

Note Some time ago we neutralized all our H_2SO_4 but in late experiments we have not done so & we start off with free H_2SO_4 Hereafter we will neutralize

Regeneration of Flake from old Cells —

Reduced to green by heat + Glucose in presence of NaOH,

The washed + flake separated by screens moving under water up + down

Then put in conical jar having paddles rotating in opposite directions + upward stream water adjusted so single flakes will pass up + overflow, but previously

treated with 2% Solution of H_2SO_4 to decolorize any green that may be between leaves of flake which act to hold them together — ~~the~~ The green is left in Seperator —

Flake Thru	on	Weighed	
8 —	10	.05	Weight of green matter
10	20	3.8	379.2 grams
20	30	13.8	
30	40	8.8	
40	50	2.4	91.5 mold
50	60	2.3	8.5 flake
60	70	1.5	about Covered
70	80	1.7	4 mil. flake 28 grams
80	110	0.5	
110	170	0.4	
		35.2 flake	

2nd Run Weighed Cathodes & Anode
200 ma 2 hours
Sol same

Acetate gms	Loss Anode	gain Cathode
2	406	533
4	231	530
6	247	540
8	125	543
10	48	540
12	76	555
	189	540

3rd Run

2	450	551
4	620	517
6	511	539
8	270	523
10	140	498
12	222	497
	369	511

4th Run

2	369	508
4	408	506
6	336	511
8	253	465
10	208	450
12	166	475
	307	486

Dec 13 Results above

5th Run

Acetate		
2	650	519
4	494	479
6	367	502
8	362	464
10	272	465
12	373	471
	419	483

6th Run

2	508	505
4	474	460
6	426	477
8	388	461
10	362	415
12	299	453
	495	492

7th Run

2	570	503
4	516	457
6	608	460
8	405	435
10	335	420
12	421	444
	476	451

8th Run

2	538	511
4	509	484
6	511	479
8	468	460
10	433	447
12	408	442
	490	470

6 Cells – Loss from Anode & gain on Cathodes weighed
250 cc Conc H_2SO_4
2 gms acetate

First Run

	loss Anode	gain Cathode
2	*404	579
4	92	569
6	148	571
8	65	577
10	28	577
12	43	579
	780	
	130	3452
		590

No free acid –
* old rough anode,

Will run same solutions again each time with new weighed Anodes & Cathodes,

See further on

New flakes from SB

Screening Test –

Thru	8	on	10	1%
"	10	"	20	50%
"	20	"	30	45
"	30	"	40	3
lost				1
				100

Of same bulk Recov'd weighs 6.75
New 5.15

This apparently shows some recovered flakes still stuck together,
The 6.75 was thru 20 on 30

We find thru 10 on 20 is even heavier weighing 8.0 grms for same bulk

Shows clearly some hydrox still holding leaves together
Must reduce more & bread longer with acid + perhaps agitate longer

[125]

the bulk should be even greater for same weight compared to new fleece for the reason its more crumpled up,

6X8 Ni bath.
Calliperes sheets also weights

	Calliper	Weights in grams
1	.0021	9.78
2	.0015	7.15
3	.00057	3.65
4	.00115	3.02
5	.00052	4.49
6	.000225	3.18
7	.0004	4.93
8	.000425	4.75
9	.00162	7.40
10	.00082	6.50
11	.0010	7.44
12	.0009	6.60

Dougherty No 2 Iron by
Carbonate Reduced 1000° 7 hrs
H displaced by CO_2

Only average about 6 grams
per pocket.
Chg 400 ma 15H – dis 750 ma to 1V
5th Run
About .363 – MAH –

Great!

I sent over to S B at Co
about 1/2 oz of fine looking
pea green $Na(OH)_2$ regenerated
from an old cell tube mix
by Glucose NaOH method –
Kept up the reduction till
NaOH was perfectly green

This short tube on
1st Run

	Tube 1	Tube 2
1st	963	1013
2nd	1177	1147
4th		1220
10th	1180	1233
15th hot	1190	1233

6X8 Cell.

1500 cc Conc Ni SO4

80 grms acetate Nickel

No acetic acid used

1st plating

Calliper .0013

No 13

Weight 8.980 grms

5 amp 28 hours

48 inches surface

Fine plating – gases considerable

+ lots froth on top of Cell.

2nd Run

Calliper 0015

Weight. 7.672 grms –

No 14

good plating

See further on for 3rd plate

Doughtery —

2. Samples of Fe_2O_3 by Na_2CO_3 process sent to Silver Lake for reduction by Hydrogen & displacement of H by CO_2

No 1 made thus. $FeSO_4$ added to hot Na_2CO_3 — Na_2CO_3 in solution in excess. Settle, filter, removed as much of liquor as possible by suction & tamping down. Dry. Heat to 400° Fahr. Leach by percolation till free of soluable salts finish washing given in Buchner funnel. Dried

Color red / Very fine great covering power but showed tendency to agglomerate

No 2

Hot saturated Sol $FeSO_4$ added to boiling solution of Na_2CO_3, which Na_2CO_3 is in

slight excess settle, remove supernatant liquor equal to 1/2 original volume. Dry. Formed hard cake, Heated to 400° Fahr, leach by percolation leached more easily than No 1, more granular, & showed less tendency to disintegrate. finished in Brachner furnace, Dried.

Color Brown

fineness about same as No 1 but denser & formed firmer nodules

More like ferrous ferric Oxide than ferric

6th

3rd plating in 6X8 cell
80 ml acetate no acetic

Calliper .001
Weight. 6.910 grms
No 15
good plating

4th plating
Calliper .001
Weight. 6.507
No 16
Has gas holes in it, where bubbles stick — This is 1st one showing holes — good soft plating

5th plating
Calliper .001
Weight 6.120
No 17
some holes, — good soft plating
(80 grms acet ml no acid)

6th plating 80 amperes 7½ min

Calliper .001
Weight 6.332
No 18

some holes - good plating
This plating had two 1/2"
bags filled with Nickel
hydroxide dipping into
Electrolyte nearly full
depth - Note that weight
has increased -

7th plating. No H bags
Calliper .0008
Weight. 6.087
No 19
good plating has some gas holes

8th plating -
Calliper .0011
Weight 6.440
No 20
plating good has some gas holes

We remove the hydrate bags
until morning & put them in again
CMJ

6X8 9th plating
Calliper .0012
Weight 6.526
No 21
good plating soft - Has holes

10th plating Calliper .0011
Weight 6.180 2 bags
No 22 -
good soft - only 3 or 4 gas holes

11th Run
Calliper .001 4 bags
Weight 6.360
No 23
Several gas holes, Thes leaf rolled up showing getting brittle

12 Run
Calliper .0009 to .001
Weight 6.073 4 bags
No 24
not curled, plating OK only 4 gas holes

13th Calliper .0011
Weight 6.395
No 25 -
good plating No gas holes

took out ½ the liquor and neutralized it with $Na(OH)$ wet sent by YVM —
Had to heat to 140° Fahr on Bobalos on hot plate to get quick action probably 150 @ 160° Fahr necessary
Cool to bath temp —

14th Run
Calliper 001275
Weight — 7.857
No 26

fine plating 6 holes but they seem all but one due to holes and defects in the Cathode —

15th Run
Calliper .001
Weight 6.928
No 27

16th Run
Calliper 00112
Weight 6.99 -
No 28

17th Run
Calliper 000925
Weight 6.562
No 29

good plating — no holes
See opposite page

18 Run Calliper 001
Weight 5.891 Several holes
Number 30 OK plating

19th Run 1/2 Electrolyte removed & neutralized
Calliper 002
Weight 7.641
No 31
Voltage 10 min after start 2.8
" 10 before finish 2H 2.6
Temp Room 75°F
" Cell 84°F 10 min before finish
fine plating.

20 Run with series same sol.
Calliper 001 Voltage after 20 Hr 2.6. End run 2.5
Weight 6.345 Temp End run 90° Fahr
Several holes plating OK No 32 Room 75° Fahr

21 Run Calliper 001 Volt Start 2.5 " End 2.5
Temp end run 92°F Weight 6.525
Room 77 No 33 good plating 1 hole

22 run
Calliper 0013
Weight 9.016
Same sol from which 22 sheets taken
Completely neutralized by gum but Weight
1st Run — No 34 from all baths used in this app — See 5 sheets ahead

29 Oct 1919

Melanie
8% + water Cuboy 5 cc
NaOH. heat to 1300° Fahr 5 hours, 5 days in 20% NaOH on butter dish on hot plate blue not great 3 hours before appearing Then soaked in 2 changes of water, dried — Dropped 1 ft 20 times, broke on 1st 3 ft drop

Dup — heat to 1000° Fahr broke on 16th 1 ft drop blue came out about same both appear OK for Comal work —

Note A piece of Nickel plating tarnished by 8/4 — put into acidulated sol of Cuboy — in 4 days was bright 8/4 disappeared —

insert this Note —

All of the Solution removed from bath after 13 runs, 1500 cc 750 cc was heated to 140 + neutralized by qvm $Ni(OH)$ wet + filtered — + put with original 750 which was not neutralized —
Hence the bath now is 1/2 neutral + 1/2 as it was acid,
This reduces acidity as a whole —
Found a metallic sediment from the anode in bottom of jar about 30 mesh also some size apparently + it weighed 27 grams
Evidently all Ni anodes shed these particles
+ Goff should save it notified him — above anode
Shed 25% of that plated out

	Anode	Cath
9th Plating 6 cells weighed		
2	478	475
4	425	453
6	292	464
8	358	450
10	312	442
12	353	465
10th		
2	419	454
4	402	424
6	471	450
8	484	453
10	538	439
12	465	456
11th —		
2	527	436
4	463	425
6	543	410
8	432	395
10	358	401
12	378	418
12th		
2	351	418
4	346	380
6	359	386
8	341	394
10	329	373
12	287	414

	Anode	Cath
13th		
2	497	404
4	430	370
6	446	380
8	387	379
10	343	364
12	353	411
14th		
2	464	419
4	462	385
6	428	370
8	452	355
10	490	360
12	447	401
15th		
2	593	466
4	562	421
6	547	399
8	523	365
10	491	397
12	484	405

See 4 sheets above

Slow 1

CuO Disc

Moulded with 4 $\frac{1}{4}$" holes in stands & 1ft drops as it was in a batch to worked poorly probably from wrong baking 1000° Fah it will go 20 when properly made & baked at 1100 to 1200° Fah & be OK —

This is easily moulded & will be OK

Oct 31 1919

81 amp + 90 amp but split dif called it 85.5
in morning found V had decreased during night from .7 to 0.22

Dischg kept constant at 400 ma.

I soaked out KOH + Zincate when dry it made 6 lb drops,

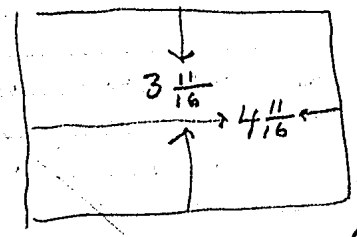
Equivalent to 732 amp hours on 2 CuO plate cells at current density of 2.46 amps for CuO — but the little cell had very much more Zinc

Note the Zinc in little cell was shingled over with ZnOX & 1½" loose sediment in bottom of cell —

Cell had 580 cc of 20% NaOH.

Big Cell uses — 3600 cc = Little Cells 7.2 cc per amp
equivalent 4970 — Little Cell 6.8 cc per amp

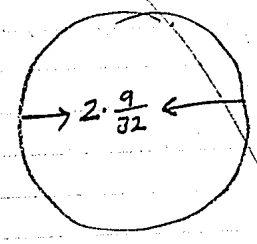
Velavde — 2 CuO plates 500 amp size



25/64 thick

Reg 500 amp 2 cu O cell 4.650 cc

450 cc of 20% NaOH used



13/32 thick

2 large plates have 6.17 times more surface than regular small plate

2 plates have 8.57 times more CuO.

dischg of test cell 101 min max from CuO disc 85.5 amp hours Voltage uniformly .7 over whole dischg didnt catch reading before

Oct 31 1919

I notice that in all Nickel anodes sheet or Cast fine grain Nickel drops to bottom of cell as anode is used up — If a Cup like bottom is originally given to bottom of Anode most of this metallic that would be caught in falling & still being in Contact would be used up instead of falling out of Contact —

Oct 31 1919 Put some floated Potash feldspar into flask with strong NaCl solution on hot plate, The idea is that in time the Na will exchange for K as NaCl take away from Sleanates of K the K + substitute soda — forming KCl — When heating K feldspar with salt at yellow heat there is a complete substitute

Will try Chloride of Calcium also see if Ca will form a lime feldspar + give KCl —

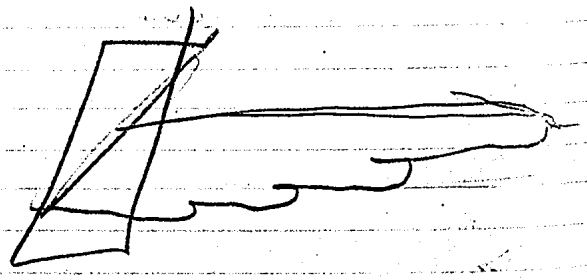
6X8 —

23 run	Calliper	00107	
	Weight	6.480	
	No 35		
24th run	Calliper	.00092	
	Weight	6.475	
	No 36		
25th Run	Calliper	00013	Inside left in a of
	Weight	8.041	all right
	No 37	no holes, specs - 2 left -	
26th Run	Calliper	00122	
	Weight	8.340	
	No 38	no holes good plating	
27 Run	Calliper	0012	
	Wt	8.053	
	No 39	Has several holes otherwise	
28 Run	Calliper	0011	
	Weight	7.550	
	No - 40	a few holes. plating OK	

19th Run Room temp 74°7.
Cell temp 74°7
Voltage

2	2.9 V
4	3.0
6	3.25
8	3.20
10	3.00
12	3.00

Note in other tests
No 12 cell is 2° higher than 2
No 2 has $\frac{1}{10}$th less voltage



16th

2	498	450	20th	2	503	409
4	487	450		4	338	405
6	470	405		6	328	361
8	473	418		8	362	316
10	492	373		10	401	355
12	452	398		12	505	380
17th Run			21	2	448	427
2	597	494		4	450	332
4	524	454		6	508	382
6	553	440		8	443	376
8	475	415		10	384	350
10	433	407		12	368	370
12	461	424				
18th 2	469	483				
4	456	474				
6	423	440				
8	484	434				
10	476	419				
12	430	405				
19						
2	343	394				
4	267	414				
6	340	412				
8	272	418				
10	229	379				
12	271	381				

Running several times without weighing 26th run used 8/4. 2 to 10 ok 12 was little too thick not so thick.
Well now plate many times all on one anode thick no 8/4.
Until 40 plating then well now weighed Cathode + anode.
32th Run on 8/4 stripped ok soft no holes.

PHENOMENON
where my head is shown on cathode the strip 001 is perfectly transparent + would act as a stencil for ambrine dye ink

see 7 sheets further on

Ford pays for Starter Bat
8.63 for one make
8.79 for another make —

Weight of .005 Ni disc of working moulds 61 grams

Now have a CuO disc
8% Benzaldehyde CuSO4 6cc 20% NaOH
baked 1000°F 5 hours
Total active surface 11 inches
2 Zinc sheet strips 1 on
each side 3/4 wide 1/8 thick
dipping in the solution —
2 1/2 inches —
Zinc Surface active 3.9 inches
" " inactive 3.9
7.8
Its voltage stands off OK

I notice that in reducing CuO by Zinc dust + weak H_2SO_4 that the CuO previously soaked in water is not so Copper bright as the dry CuO dust put right into Zinc mush. The 82 amp 1st test was not previously wet so this is probably right way to do it

I think the porosity of the new process $CuSO_4$ bake + 1000 bake is very much greater than old process high temp bake

Tried dehydrating $CuSO_4$ Crystal in boiling Strong oil — NG —

Lecture 9/24/[illegible]

Fred Otto Cell 6x8, 2.5 Volts, 5 amp
2 hours 25 watts 6.5 grams
3.84 Watt hours per gram
1.728 KW Hours per pound
Metallic Ni — Under Worst Condition, by heat + rotation should be less /

I notice that in reducing CuO by Zinc dust + weak H_2SO_4 that the CuO previously soaked in water is not so Copper bright as the dry CuO dust put straight into Zinc mush
The 82 amp 1st test was not previously wet so this is probably right way to do it

I think the porosity of the new process $CuSO_4$ 6 c.c + 1000 bake is very much greater than old process high temp bake

Tried dehydrating $CuSO_4$ Crystal in boiling Strain oil — NG —

Fred Otto Cell 6x8, 2.5 Volts, 5 amp
2 hours 25 watts 6.5 grams
3.84 Watt hours per gram
1.728 KW Hours per pound
Metallic Ni — Under Worst Condition, by heat + rotation should be less /

Jackson
Feb 24

37th Run 2-4-6-8-10-12
with 8/4 all OK & all alike, OK
no holes-

40th Run

2	491	335
4	554	329
6	315	300
8	335	292
10	370	350
12	267	302

45th Run 8/4 - all good plating no holes
soft Ni

50th Run 8/4 all good flat no holes
same thickness - 2 hour
300 ma Cell Voltage 3.1
Cell temp. 86 - Room temp 81

55th Run Volt 3.1 Temp 78°
Room temp 76° - 8/4 plating OK
only ~~8~~ 4 12 one Edge slightly Left -

62nd Run all OK but 12 which
~~stripped which Tore full holes~~
~~but this was brass~~ 3/5

8/4 dont seem to work on Brass

60th Run Weighed

2	476	431	
4	606*	401	* piece anode dried
6	355	377	Volt 3.
8	362	370	Temp Cell 83°
10	417	374	" Room 79
12	361	361	

Nothing but Water has ever been added to these 6 Cells since they started - ?

67th Run with 8/4 Cathode - OK not so flat as usual, few holes in them -

77th Run 8/4 - good plating tough no holes - 2 4 + 6 dead flat 8 10 12 bowed up slightly - but tough - 12 thinnest.

82nd Run OK -

91 Run all perfect no lifts

[ITEMS(S) FOUND IN BOOK]

Sept. 30/19

...ple on Watch glass
from Mr. Edison 9/30/19

Marked :- Residue in Nickel Bath

This from 20 moulds
.005"/" thick scale

This is not a basic Ferric Acetate,
seems to be a mixture of Ferrous
and Ferric Hydrate, 1/3 former
and 2/3 latter, probably
Ferroso-Ferric Hydrate. —
In forming in solution of $NiSO_4$
and Magnesium Acetate, it has
evidently carried out other im-
purities.

Water Soluble :- Consists of $NiSO_4$
entirely, no Fe or Cu Sulphates
Acid Insol. This is probably
3% of the mixture and consists
of sand, nickel scale, some
organic matter that chars by
action of Hot Sulphuric Acid.

See next page

[ITEMS(S) FOUND IN BOOK]

(2)

Soluble (Dilute H_2SO_4)

Ferric Hydrate :- About 2/3 Lime

Ferrous Hydrate :- " 1/3 "

Copper :- present

Manganese :- "

Lead :- none

Bismuth :- "

Arsenic :- faint trace

Antimony :- "

Alumina :- faint trace

Phosphoric Acid :- very faint trace

Carbon Dioxide :- none

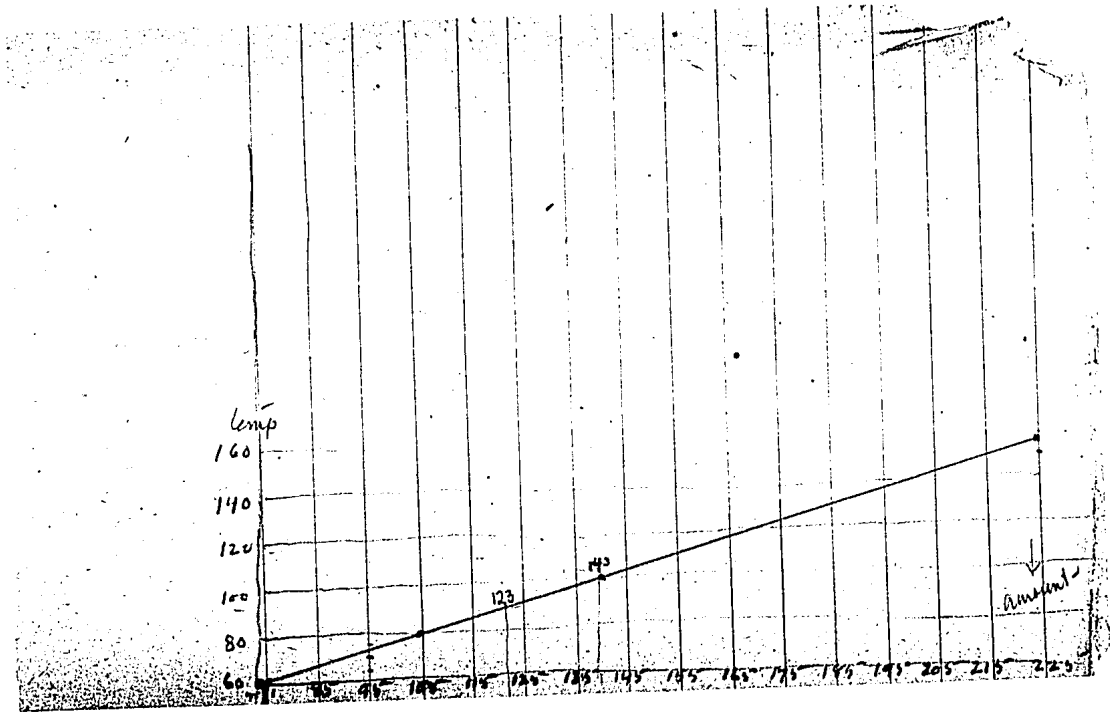
Acetic Acid :- Considerable detect.

Lime :- trace

Magnesia :- " (about 3 times as much as Ca)

E. B. Hughes

[ITEMS(S) FOUND IN BOOK]


temp
160
140
120
100
80
60
123
143
amount

Notebook Series -- Notebooks by Edison
Notebook, N-19-11-04

This notebook was used by Edison during November-December 1919 for entries, some continued from N-19-10-06, pertaining to a variety of subjects. The notes at the beginning of the book relate to the formation of zinc and copper oxide plates for batteries, the motion of sound waves through long tubes for recording purposes, and the reduction of iron by hydrogen for use in storage battery pockets. There are also notes and drawings concerning diamonds used for phonograph recording and reproducing, including one entry bearing the notation "up to date science applied to the Diamond grinding industry." Some of the notes pertain to the electroplating and electrolytic cleaning processes involved in disc record manufacture. One entry lists the steps in the production of disc records, while another describes current practice for stripping the record molds. There are also recording experiments involving various placements of the funnel and variations in its length, along with experiments to find a substitute for the celluloid used in Edison Blue Amberol records. The entries toward the middle of the book relate to the regeneration of old storage batteries. Also included is a list of what to patent from research on a Ford automobile starter battery. In response to learning that an employee has been misreading the ratings of batteries being tested, Edison comments "verily the Entrepreneur is up against the low mentality of the modern American young man." He also notes that "I am working all night to right other people's neglect." The cover is labeled "No 6 General Book Novembr 1919." The pages are unnumbered. Approximately 60 pages have been used.

Nov 4th 1919

I took some fine Zinc dust + pressed it into button 25/32 thick used 3000 lbs on it.

It seems to be just like solid Zinc Metal very strong + good surface

I shall try these in CuO 20% NaOH. to act as negatives

I figure that if a Zinc plate for a battery with alkali is made this way that the $Zn(OH)_2$ need not dissolve in the soda at all as it will probably fall off as a powder + go to bottom of cell + that the large volume of alkali necessary to actually dissolve the $Zn(OH)_2$ will not be necessary This property of forming powder will be valuable

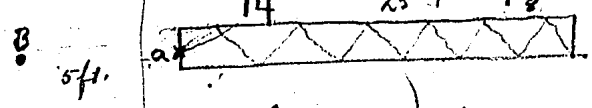
in a dry cell where colloid or blotting paper is used because the ZnOH will be a porous powder permitting free passage of the alkali to the Zinc & making it unnecessary to actually depolarize the Zinc it really act like, as in the alkaline storage battery —

Another use I intended for the pressed Zinc powder plates was to use them as a lap — Powdered diamond bort being mixed in the Zinc powder before moulding — Then the lap would be charged all thru & be held in place — The diamonds being recovered by dissolving plates in acid & filtering out the diamonds to be used again & so on

I am now processing a disc 5/8 same as I did Zinc using very finely divided Iron from Carbonate of Iron Reduced to metal by Hydrogen + when cool displacing the H by CO_2 to prevent it taking pyrophoric +
This would make a stronger Lap than Zinc

I have had laid out on the drawing board 7 cylindrical tubes each 20 ft long with following Diameters

2	25 ft
4	25 + $\frac{3}{32}$
6	25 + $\frac{1}{4}$"
8	25 + 3/8
10	25 + 9/16
12	25 + $\frac{27}{32}$
14	25 + $1\frac{1}{8}$"



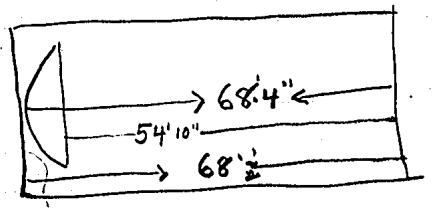
If a source of sound starts at X
The length of the straight waves from the Center is 20 ft.
but the length of the greatest reflection wave is 28 ft
for all Sizes of tubes

But if source of sound is 5 ft away from a + at B.
the lengths of waves will be see X

The length of the waves in the tubes alone at a is always 8 ft longer for the worst condition than the length from the center producing great muffling

But when 5 ft away. the length of the waves in the worst condition is only very little. One + 1/8 inch with 14 inch tubes — Hence great diminution in muffling

Columbia St Studios



30 ft wide

Oct 5 1919

Iron by H. Cleared with CO_2 from Carbonate procedure No 2 Daughtry - pressed in pockets, very light most Ural could get in about 6 grams To 1 Volt

Run	8077	8078	8079	8080	
6th	487	612	475	400	disch 750
9th Run - Chg 400 ma 15h disch 300 ma to Volt					
9th	745	775	745	700	

Nov 5 1919

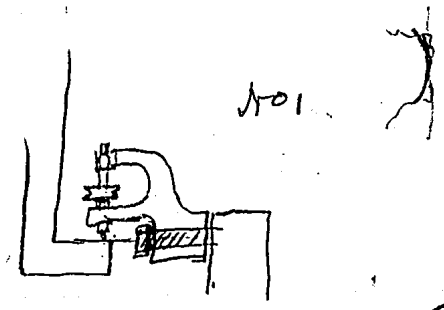
We grind the Sulphate Copper after Dehydration on Hot Steam plate, in the Little Porcelain ball mill — Use 9 lbs of 5/8 steel balls grind — One hour min — 90% goes thru 180 mesh screen is OK —

So far the best CuO Cell is mix of CuO thru 180 — 100 gram 8% of Dehydrated Cu Sop thru 180 mesh — Mixed in mortar by hand adding 6 cc of 20% NaOH gradually and co mix it Moulded at ___ lbs in hydraulic & baked 1000 to 1100 but not below 1000 — for 3 to 5 hours Dried on hot plate before putting in furnace — Best one Stands 20 ft drops & 20 3 ft drops — 82 amph output Constantly at .7 Volts 400 ma rate + is

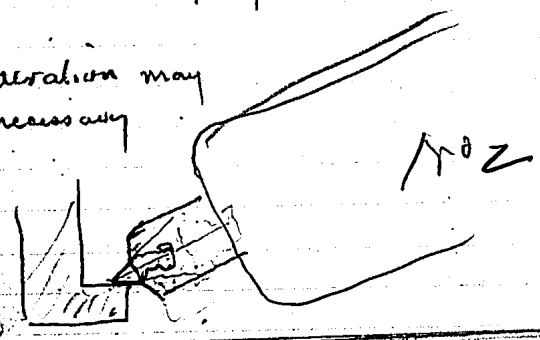
remarkable for high output
gives 730 amp h as compared
to a 2 plate reg cell as
far as CuO is concerned,
after fully reduced & washed
free of salts & dried it
stands several 1 ft drops
& is incomparably stronger
than reg CuO plate pieces
after reduction showing
integral character —

We do not get the CuO down
constant in drop test
perhaps due to imperfect
mixing or imperfect loading
the latter is probable cause

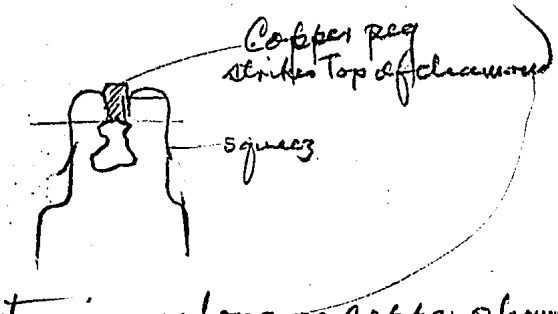
Diamond Point-
Recording Saphire is
.008 Dia
Reproducing Diamond
.007 Diameter



No 2 operation may
not be necessary
at all,

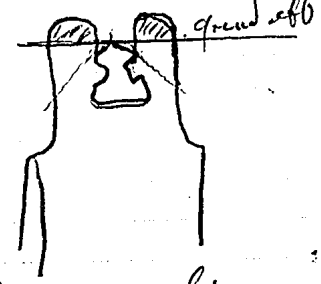


Diamond Could –



Entwining as long as copper shows you know you haven't reached diamond

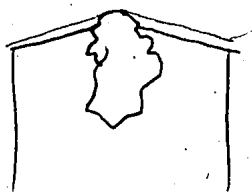
Also grind steel off flat until Diamond shows by using Carborundum lap - fine dust.



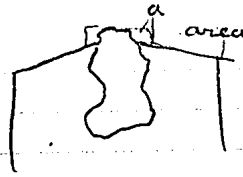
probably can roughly angle it with Carborundum lap for steel only – Thus no lathes turning tools + labor + loss by breaking lap till diamond shows top of sides

lap worn off with Carborum lap -

Then use No 1 to round



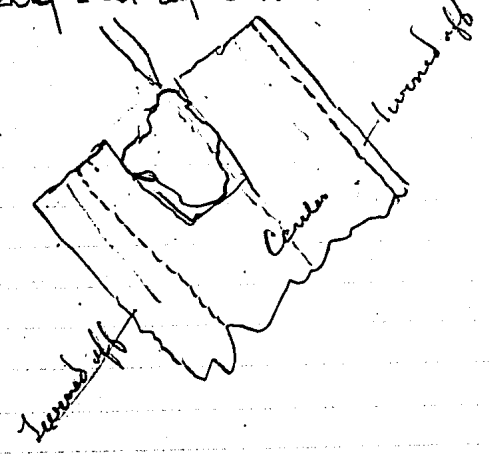
this line by Carborundum lap



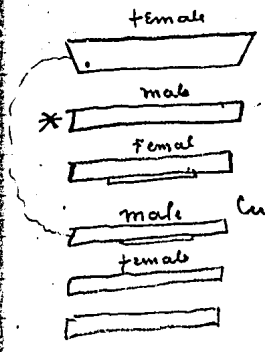
area for Carbo lap

a - lapped by Diamond lap No 1 machine

It will be impossible to set the diamond in the hole in the chuck so the best available point of the diamond will be in the exact center of the chuck But after diamond is exposed The chuck or holder can be centered under micro by a sharp point and chucked at this point the steel being turned so body of holder is concentric with center of diamond, if this is found necessary where stones are very out of center



Tel Nov 6th 1919



Wax

Master metal mould Cu

Label on this

2nd Master

Female

male Working M Nickel

The above is with 8/4 no celluloid

Working OK as per Gall.

6 sets 72 records in press Nov 6 1919

Gall says good.

* Master Metal mould only used once then goes back to Vault

2nd Master is the one repairs are made on -

Will also send some females (when got enuff records) back to Vault so if get further orders can use them also -

Nov 7 1919

I found the old die we once pressed iron mix in uniform of plates to go in pockets of Mfg St Bat -
Made some slips of flour of Zinc 15 grams -

about $\frac{1}{8}$ thick.

I will set up 3 small cells using one Zinc plate + 1 disc of CuO with not enough 20% NaOH to dissolve the whole of the Zinc - I am in hopes that when the NaOH is saturated with ZnO that the ZnO in situ will be porous so as to permit action to go right on notwithstanding it will not dissolve, this due to non integral character of the pressed Zinc, if it does

it makes a dry CuO Zn Cell with porous absorbers a success - (12) a perfect dry cell

There is 3 Cells with Zinc stripes made with 1000 lbs pressure 2000 lbs + 3000 lbs —

Also made 3 iron by H powder (Doughlery No 2) They look fine will last one in Gallery —

The other one will weld in Hydrogen + Keep one 1000 lbs for Cell 3000 to Keep + 2000 for welding —

This consolidating fine metallic powder into difficult shapes by moulding + afterward making the cohake integral by high temperature in an inert gas say Hydrogen has a great Commercial use

Zinc Callipered	1000 lbs	128–1000
	2000	113
	3000	107
Iron "	1000	125
	2000	105
	3000	94

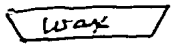
Have sent 3 iron bent H slips as above over to D Bat Co to have run thru hydrogen & weld integral

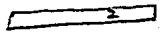
~~but~~

Heat was not high enough to weld integral, shrunk much

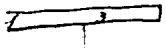
Nov 7 1919 —

Following is method now being used in the stripping process, 8/4 films no celluloid





Copper master mould



Female stripping of Copper, This stripping is played by a special light weight reproducer which does not in any way injure the female but makes it possible to detect every defect and makes the repairing of the female a simple matter

After female is repaired the label a is stuck on by shellac & then prepared in usual way for plating

Second Master, which is better than the original because it has not lost a particle of the detail, no increase in surface noise, defects which original had being eliminated

over

bears the label practically
does away with repairs in
next operation because they
have all been taken care of in
making 2nd Master - Insures
the original master which may
be returned to the Vault,

00000
00000 } Ten females made from 2nd
master which practically
need no repairs

00000
00000 } Ten Nickel working moulds
from each female.

Phonograph Recording

1st foot of big end of long funnel 14" dia at big end has 16 times less friction that the foot at the small end.

If we double the length of the 14" funnel we will when the voice is 6 ft away from the mouth get $\frac{1}{63}$rd of the sound wave, with present length we only get $\frac{1}{333}$rd.

By doubling the length of 14" mouth funnel we only increase the friction 20%

At 6 ft with double length funnel the voice will be 1/5th more muffled, at 7 feet the muffling will be the same as with present funnel as the angle at 7 ft is so much better.

The volume of sound

will be nearly twice as
loud or correctly 80% of
double loudness,

g

I fear all our work for last 2 months in getting higher Voltage on CuO battery has been useless. The Experimenter has been reading .040 MV instead of .400. although he has looked at it for 2 months & it is plainly marked
Verily the Entrepreneur is up against the low mentality of the modern American young man =

I find there is no trouble in getting a fine surface on Matte side of the plated Nickel sheets .001 thick used fine Emery paper.

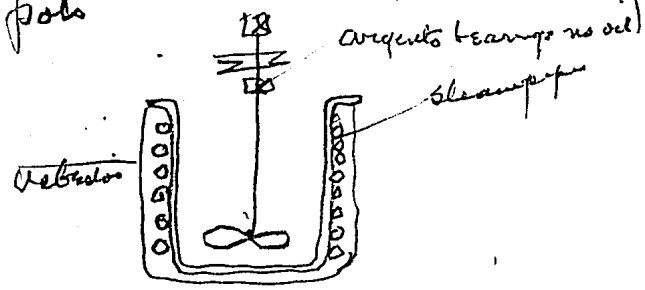
Believe we can quickly polish right on Cathode before removing

I made up fairly strong 8/4
Selenic acid sol 1/2 min to
dark red — put 4 unvarnish
Disc slips in at 11 10 am
Now 10⁻¹ after a number of hours
will take out 1 + bend it +
Examine it under Micro.
The others I will mix sulphur
with Reg Varnish + Condyne
it + see if Sulphur hurts
Matrix. Idea being to
Mould records with
Hard rubber mixture + prevent
S from hurting Mould
also as a substitute for
tin foil in hard rubber
sheet making ~

Took some of Big Lot.
Pi dise ~~electrolyte~~ that
went bad

Nov 7 1919

Gall has rigged up 2 stirring pots



for Taking out 25 gals at a time from General Ni plating Sol & neutralizing the acetic by dissolving Nickel hydroxide

The other pot also used for this — both or one pot can be used for making new solution $CuSO_4$ acetate Ni. —

100 to 110° Fahr is best for neutralizing if done at 140 the acetate Ni hydrolizes

GJ

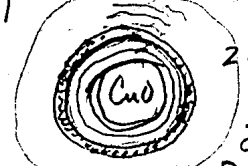
Gall will furnish me with a drawing of a glass holder in place of a Condensito holder for rotating shaft in plating bath. These do not remain flat when heated to melt the sticking on wax whereas the glass will not warp. We get the special glass from mfrs of our battery jars which sustain such extreme variations in temperature without cracking —

We stick the metal mould face down on the glass using a mixture of stearic acid & Rosin. This works perfect & prevents plating solution running. It works so far 100%

When we get blanks we will surface face flat & sides to fit the holder in bath —

Nov 10 1919

Dry cell — wax paper —



2. Perforated Zinc Shell filled needs well Zinc powder & placed in Hydraulic 3000 or less —
all soaked 28% NaOH.

NOTE

I find that 8/4 Selenide Cu must not get too thick if a solution turns red in 1/2 minute & then Copper left in 7 minutes it flakes & rubs off

So in redipping a Cu disc mould & it takes 1/2 min to get dark red the Redip in the same strength of 8/4 should not be over 6 seconds,

CUS

Nov 11 1919

Regeneration of old Storage battery mix

After 80 hours in the reducer 100 grms of mixture yield

19.8	Requiring more reduction
49.2	Nickel hydroxide
2.6	Nickel flake fine
2.6	" Coarse
2.0	$Ni(OH)_2$ as $NiSO_4$
13.2	Moisture + Alkali
10.6	Mechanical loss
100%	

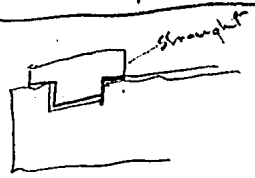
A Delaunde good drop. CuO
put up with 2 Zincs 1/2 sq
or 2" surface 2 1/2 inch in
solution 20% NaOH. Amalgamated
on surface ~~[illegible]~~
Went 76.8 amp Hours
~~to~~ to .5 Volt. Whereas
2 Reg sized Zn went to 82 amp
to .7 Volt, showing must
have more Zinc surface
than 5 inches to keep
Voltage up — 78° Fahr
Room temp average on Round
CuO —
Both Zinc are increased
One has 1/32 inch hard crust
hardly cut off with knife
after chipping found both
well amalgamated — it is
the increased Solution that ran the
Voltage down in addition to
high density of Current —

Calculate it out

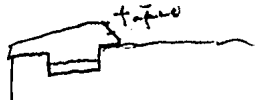
I Cleaned Zinc & put Complete in
new Sol and 1/2 hour .67 400 ma
went below .50 V in 2 Hours + 1/4 CuO good gas

Delaunde

At Silver Lake pressing CuO plates. One man weighs out & puts in Mould the other man at press. presses 125 per hour.



present ring



old ring

We have 2000 old rings will try use them — but will try out 2 press loads for 2 months or get % before using other alloy

Upto date science applied to the Diamond grinding industry

A soft lead bullett passes thru ½" of hardened tool steel at Velocity of 2800 ft second A Candle can be shot thru a 1" pine board with proper Velocity - A thin plate of steel with 15 to 25000 ft per surface Velocity at the Edge Cuts off steel bars rapidly when Cold with only little wear to the Edge of the disc

So I am building Lapo with a Velocity of 17200 ft a second to grind phano diamonds & thus saves Diamond powder this increased Velocity is many fold greater than Lapidary art Ever conceived up — There is some rate or Velocity that Saphire & Even Carborundum will grind the Diamond

Nov 14/19 Ford Slocum

Patented 1- forming Ni sheets
2 = assembled battery end plates
bolted together -
3 - did? file spacer for spreading
active material by flotation
4 = patent side connections,
5 " two staggered lugs each sheet
6 " float index for water
7 " previous alkali treatment
of the paper,
8 gas channels -

Nov 14/19

Our plating equipment to date is
1560 Baths - divided as follows

200 Sulphate Nickel
1200 General Copper
160 Preliminary Cut Master
1560 -

Gall says above equipment is far beyond our present requirements when we get making all our moulds by stripping process. This great capacity permits us for first time to mfr new moulds of entire Catalogue of standard & Classic selections, which we so urgently need.

Daily Capacity 400 stripping of Nickel & 400 Copper backs daily

Experiment for neutralizing Reg
Ni SO4 Conc + Acetate Ni Bath
used on works for plating
stripping discs –

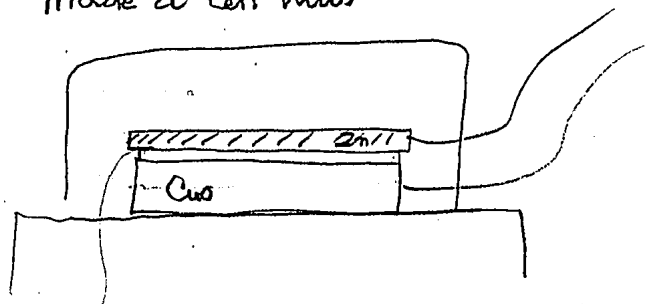
Took 1500 cc of solution from
big crocks in factory that
been plating 78 Baths for
10 or more days

Found that at 100 @ 110° Fahr
it becomes neutral with
of hours with stirrer

Used 14.3 grams wet Ni hydrate
from Miller which contains
30% water – or 10.1 grms dry
Then it was filtered through
2 thickness of Linen (fine).
it went down in 20 minutes
diameter bag 2" length
where liquid was 5".
Sediment after drying
weighed 5 grams –
Sol neutral using 5 grms 1½ liter

Nov 18 1919

Made a cell thus



Reg Blotting paper wet with 20% NaOH.

Dia of CuO plate 2" 9/32 Reg Cast Zinc No Hg

	Volt	Milamp
1140 am-	.82	100
1240 pm-	.77	"
140 "	.68	"
240 "	.60	"
340 "	.59	"
440 "	59	"
540 "	58.5	
on all night		
8.30 am	.51	"
930	.01	15 gone

Ran 21 Hours. 2.1 amphours

5" inches CuO + Zn surface Each 5

420 Milamp per inch of CuO

C813

Nov 18/19

"2" bag 2 thickness of finest weave linin, filters thru 5" of its length, 1½ Liters of New Nickel plating Solution when neutralized by $Ni(OH)_2$ J V Willard Reg — leaving Residue in bags — The particular Experiment tried 10 grms were added to 1½ liters & 5 was taken up making Solution neutral, 5 left on bag

Hence 1 ft of 2" bag filters 2 gals per hour.

Nov 20/19

Experiments for substitute for Celluloid for Blue Amberol Records as Can get no more Celluloid after July 1920 on account of the Camphor shortage —

Took Pontiac Rubber & Mixed in hot rolls with China Clay — after reaching limit of Clay it is too dead & scratches easily & acts like thin lead —

20 grms Pontiac 4 grams Sulphur 5 grams China Clay good even sheet like soft lead — Vulcanized between 2 8/4 in slips in sand bath over flame Went to hard Rubber good black polish hard, Came away from the sheet fine, had cavities as done in 5 min & too sudden This can be made to work

Ambrosol Condensation

Think I can take smooth inside Cylinder & Coat Reg Condensite Varnish 2 coats, then put in Kiln & bake to 1st Condensation point Cool & remove — Use this to print with say 4% Paria, Chill & remove back up with Cluster Fabric

Some Crepe Rubber. (Mat for tea tray)
20 grms - 4% sulphur
+ lots of China Clay —
Dont stick to Roll & stand lots clay - finally check on Roll by Hack Cohesion, but let run it out 1/32 or less get sheet OK 2 ft long - 3" wide.
its lumpy — Roll must be very hot at end

When cold strong only has a little of the Rubber nature - If Sulphur is

might think it will Vulcanize
to Hard Rubber →

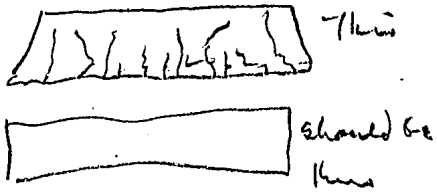
Note = It is a phemenona that
all Ni plating Solutions improves
as they get older in our
strip Tumbler Cells it takes
about 6 Runs to bring them
all right This phenomena
Runs through all kinds
of Ni Electroplates & I believe
that it is due to a very
small quantity of some
metal which accompanies
all nickel -
I shall run it down &
find what it is -

Nov 25 1919

Lelande –

I find the strength of the CuO plates depend largely on the way they were dried in the air –

If the $2\frac{1}{4}$" disc is moulded & laid on a screen & dried in Room air They generally have Cracks in them. The Top & Sides get dried 1st This causes shrinkage & as core is not dried they crack – The bottom is bad When put in furnace this defect is Multiplied.

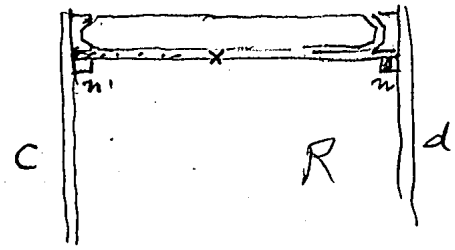


Hence should be dried hot & on all sides at once –

C913

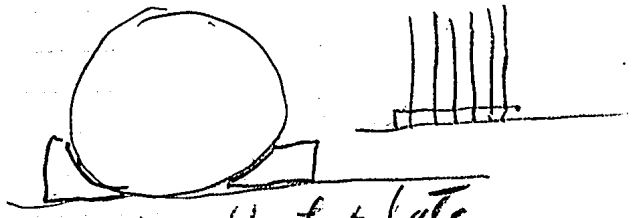
Took 10 grams CuO 150 mesh, dried it then added 10 cc water mixed in Mortar, then laid it out on glass dried 2 hours it appeared dry
Sample by Edison gained on rubber head 40 mlg
by Hart 48 " "
The porosity of individual particles is therefore small & of no account.

I propose drying reg. plate 4×5 –

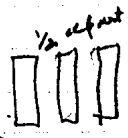


after processing put on non-plate shoot in rack R. When full turn up & make C the bottom & the top & withdraw plates X from thin pins n' n. Then can goes all over

Gall Nov 26 1919 says he
takes the 2 wax masters of
Each tune, plates + gets copper
masters, One of these he puts
permanently in vault, the
other he films with 8/4
+ gets all his factory
moulds from one print
from this, + puts it in
Vault, So we have
one Master never used
+ One Master filmed
once with 8/4 print
in Vault, so if anything
should happen to filmed
Master we still have
a Virgin never filmed



Hot plate



This is best as hot
air covers whole surface

Equally - should have
air above 200° fahr will
determine how hot
& how long —

We determine perfection of
baking of the 2# dough
by dropping it 6" high
on blotting pad & then
throw which make 20
falls without breaking
we let fall 12" good
ones so far all dead
20 6" drops & from
1 to 7 at 12".

Should all go 20 at 6"
& 3 or more at 12" after
the 20 6" drop —

All the above are
Not baked to 1200 —

These should go 20 1ft
& at least 6 drops at
3 feet —

Dec 1st 1919

Gall reported his bag No 504
Nacetate sol gone bad,
OK up to Saturday 4 pm
They added some more solution
at that time & whole about
400 gals went bad.

They pulled it out of baths
piping & Crocks & made a
new solution just enough
to keep them going

I feel he has not neutralized
bath with Na (OH)2 since I
started although I told
him it must be done & he
was told to get Crocks,
Stirrers & filter bags ready
Keeping solution from 90
to 100 Tabs, now I feel
he has not used it,
Same old story —

All the bag sol is now

transferred to a seperate Crock
Soon as he told me went to
work to find out trouble
with Sol. 1st found it as
Expected very acid
2nd found it loaded with
Copper which is the worst
thing possible has about
1%

I find that Barium
sulfide in right proportion
added dilute and gradually
stirring for few minutes
not raised temperature
takes all the Copper out
The solution untreated
Coppers steel brads cleaned
by dilute HCl slightly -
But not when proper amount
of BaS is added - if too
much BaS is used it throws
down Nickel by abandoning
Sol of BaS all the Cu and
by eliminated with only
a little Ni -

I propose fixing the big Sol this way & then nearly neutralizing —

We should only use $NiSO_4$ & Ni Acetate free of Copper & Anodes as free of Copper as possible — also see backs of Cu Molders are well varnished so no exposed Cu to oxidize in air at each Revolution & hence this oxide dissolves in solution

Also Anodes scraped free of Cu at times & keep all Cu things away from the Solution —

The Sulfide of Cu settles quickly used 290 cc & while stirring poured it in a 290 cc Measuring glass put in 3.02 AM at 3.05 black precip sunk to 90 cc 3.10 am to 70 — 3.17 to 60 3.50 am to 48 cc
This morning 2nd 45 cc

It will be seen I am working all night to right other peoples neglect,

I have just taken out a strip from the little test cell — 1 hour 30 min 300 Ma rate OK plating + yet its the big lot that went bad + I have only removed the Copper by Ba S + have not allowed to neutralizing it its very acid — Strip Nearly as tough Ni as usual + only one Corner turned up showing that if it had been neutralized only a little the plating would be perfect. Beware of Copper.

5 cc of a saturated Sol of Cu SO4 put into 250 cc of pure Ni SO4 + 5 grms Acetate Ni makes it impossible to plate

Everything should be done to keep Copper out as its fatal to this Solution even in Traces

---

I took some of big Lot and reduced + now in crucible added Barnsfield till free of Copper

A. Cell – nothing in –

B Cell – Nearly neutralized by NaOH

C Cell – 1 cc Ferric acetate Conc

D " 1 cc Conc Ferrous Sulfate

1 Hour 300 ma

~~1st test~~ A. worst of the 4 – Cracked, brittle, Comes off

B Ckd, + lifted, Ni fairly tough

C About same as B

D left Early brittle,

1 Hour 3rd Run		3rd Run
A	fair	Nineth Run
B	fair	All OK
C	not good	
D	very bad	

I find that a bad impression as more runs are made — until 7 Runs When all are alike — 1 hour 300 Ma one Edge on all slightly turned up

from this there must be some impurity in $NiSO_4$ solutions that produces the bad results and that it plates out in the Ni in time & when Exhausted the plating is fine —

9 | 5
1 | 1 What is it, find out

The regenerated $Ni(OH)_2$ from old returned Cells is full of ferric hydroxide & that seems the reason why they diminish in Capacity by heat. The heat cause greatly increased solubility of iron in the Electrolyte –

Mix from old cells when not too old has their ferric hydrox renewed fairly easy by reg treatment with glucose & NaOH, to green stage & on heat shows capacity fully equal to new $Ni(OH)_2$

But from very old cells for instance A6 giving only 130 amp hours instead of 225 the treatment produces a dark colored $Ni(OH)_2$ some of the particles green –

By a separate treatment with stronger NaOH, 10% & 1/2 % of glucose & prolonged heat. The whole of the iron

is removed, probably because weak glucose is strong Enough to reduce the ferric to Ferrous & the stronger NaOH, dissolves it. The result is bright green Na_2FeO_2

Velande — S Lake says they. Mould 100 plates per hour in one press. (500 amp type)

Dec 4/19. Doughtery is making some Tellurous Acid to see if forms a better film on Copper than Selenious acid (12) in respect to Expansion when on thick —

Dec 6 - 19

Regeneration —
Sample No 2 sent to Test dept Storage Bat for test. This is from 10 A6 Cells which only gave capacity of 135 amp-

Process 400 cc 10% NaOH 1% phenol
100 grms black $Ni(OH)_2$ or
30 " glucose -
Boil solution, add glucose in portions of 1/2 gram Every 8 minutes.
takes 1 1/2 hours $NiOH_2$ dull green has some fine spangles of flake

May not be enough in sample to make a test
Marked Edison No 2 $Ni(OH)_2$

New Experiments with $NiSO_4$ + acetate Ni

Pure $NiSO_4$ Cu out by H_2S -

250 cc - 1 grm acetic acid 300 ma shown thin but OK only 1 corner turned up tough -

ditto — 2 grms Ni Acetate -
Bad Cracked Sides turned up & Cracked = May be Acetate
Ni has Copper in it -

481
Very bad 2 grms ferric Sulfate
2nd one corner up thin -
476
OK in every way Thick Ni acetate 2 gr
2nd OK
477
OK but 1 Edge turned up
2nd 1 Cor up OK 1 grm Acetic acid

478 5 grms acetic acid
OK but 2 Edges up
Thin 2nd Very thin - Tough

479 - Very bad awful plain
M504 - 2nd OK - cor up

489 Very bad, 2 gr ferric acetate
2nd OK -

~~489~~
One Corner up - thin -

~~489~~

See further on

Mr Soy Cu removed —

477. 1 gm acetic acid

1st Run — OK 1 Corner up
2 " "
3 " " Sharp point 2 Edges up not tough
4 " " no points not very tough 2 Cor lifted
5 " " OK. 1 Cor lift Tough & OK
6 " OK
7 Perfect Except few sharp points
8 perfect except few sharp points
9 Perfect
10 Perfect 1 Cor slightly up
11 Perfect, 1 Cor up slightly 1/2 dozen points
12 " 2 Cors up slight

478 — 5 gms acetic acid

1st Run OK 2 Edges up
2nd " OK but very thin Tough
3rd OK thin & not very tough thicker 2 Edges up
4th — Cracked side Corners lifted not tough
5th Cracked 1 on side — Corners all lifted Not Tough
6 1 Corner bad turn up, not very tough
7 faint 1 Cor up — Tough —
8 OK 2 Cors up —
9 1 Edge up —
10 Good 2 Cors bad & top slightly up
11 perfect 1 Cor slightly
12 " plating 4 Cors slightly

479 Reg Nesoy rolling in

1st Run Very bad - awful
2nd Run OK 1 corner up
3rd Run OK. 1 " not perfect at edges Tough
4 " OK edges little ruff fairly tough, flat
5 OK no lifts tough ? ? ?
6 2 cor very slight turn up Tough
7 Perfect except very faint 1 cor up
8 full of points bad, otherwise OK ?
9 full of points bad "
10 Perfect
11 Perfect
12 " 3 cor slight lift

480 2 grms Fabric acetate

1st Run Very bad
2nd Run OK
3 Run OK thick. tough
4 Run OK faint turn up 1 corner — Tough
5 OK no lifts Tough — Very good
6 1 slight lift Very Tough, thick
7 perfect 1 cor slight up —
8 Perfect
9 full of points Very bad "
10 full of paint not bad
11 Perfect 1/2 doz points Curls colum off
12 Top peeled up — perfect plateau

481 – 2 grams Ferric Sulphate

1st Very good.
2 Good fair 1 Cor up –
3rd fair poor edges – no Turn up
4th few points .. turned up slight 4 points fairly Tough
5 OK no left Tough –
6 2 Cor turned up slight, tough
7 perfect.
8 perfect.
9 perfect.
10 1 corner up slightly considerable points
11 perfect
12 perfect 1 corner up – flat

476 – – 2 gram Ni acetate

3rd 1 Edge up not Tough
4th 2 Cor lifted not very Tough
5 good faint left 1 cor tough + OK
6 slight turn up 1 cor OK tough
7 perfect –
8 perfect.
9 perfect
10 " a few points
11 " " "
12 " perfect 1 Cor up

506 = 4 grms Ferric ~~Lactate~~

1 = Like polished school, thin, brittle, Cant strip

2 Come off entirely. left full 2nd coat,

3 Come off nearly all – Mirror like, brittle

507 4 grms Ferric acetate

1 = OK – Tough,

2 Half Curled up from bottom, 2nd Coat tough

3 bottom Loose, not curled up – not perfectly tough

482 250cc 3 M Acet 1 CoSo4
1st Jap bottom peeled up some, longrock

487 250cc 3 M Acet 1 Alum SO4
1= Dark, breaks straight up knife takes off as a powder Horrible pleading
NOTE Bad effects,

Dec 8 1919

Gave Moore some Fe_2O_3 from Fe Carbonate oxidized made by Dougherty to try in NaOH glucose to see if long boiling will reduce it to FeO ready for test in Cell — Watch it.

(13)

Notebook Series -- Notebooks by Edison
Notebook, N-19-12-06

This notebook is a continuation of N-19-11-04. It was used by Edison during the period December 1919-January 1920 in connection with his attempts to improve the plating solution used to make nickel-iron batteries, as well as the solution in the battery itself. Most of the entries describe numbered electrolytic and chemical preparations used in electroplating and contain notations regarding the condition of the plating on successive runs. Also included are descriptions and speculations relating to the electroplating processes involved in storage battery manufacture. A few entries pertain to the regeneration of old storage battery cells. The notes indicate that E. E. Dougherty and Sherwood T. (Sam) Moore assisted Edison and that matters concerning battery manufacture were brought to the attention of W. J. O'Dair at the Edison Storage Battery Co. The front cover is labeled "No 7 General Book Dec 6 1919." The pages are unnumbered. Approximately 100 pages have been used.

Dec 6/1919

1 Hour · 300 ma —

476 - 2 grms Ni acetate 250cc Cufree Ni SO4

Run

3 one edge up, not tough -
4 2 corners lifted - not very tough
5 good — 1 cor faint lift - tough, ok.
6 OK 1 Cor slight lift "
7 perfect
8 perfect
9 perfect
10 Has a few sharp points
11 "
12 Perfect 1 Corner up
13 Perfect
14 Perfect
15 perfect
16 perfect.
17 " 1 Cor up

CO

Dec 6 1919 300 ma 1 hour

477 – 250cc Cu free NiSO4 1 gm Acetic Acid

Run –

1 OK 1 cor up
2 "
3 sharp points 2 edges up – not Tough
4 No points not very tough 2 corners lifted
5 OK 1 cor lifted Tough OK
6 all right
7 Perfect except few sharp points, sticks to Cathode at point
8 Perfect " "
9 Perfect
10 Perfect 1 cor up
11 Perfect " ½ dog points
12 " 2 corners up slightly –
13 perfect 2 "
14 Perfect –
15 perfect 1 cor up
16 perfect 1 cor up
17 "
18 perfect.

CO

178 = 250cc Cupree Nitrate — 5 grms acetic acid

OK 2 Edges up.
OK but very thin & Tough
OK Thin + not very Tough but thicker than 2nd 2 Edges up
Side Crinched Corners lifted - not Tough
" Corners all lifted - not Tough
one Cor big turn up - not very tough
faint turn up 1 Cor - Tough
OK 2 Corners up
one end up
Good - 2 Cor bottom + Tops slightly up
Perfect 1 Cor slightly
Perfect 4 Cor "
Perfect 1 cor up
Perfect 2 "
perfect —
perfect 1 Cor turned up - usual
" 2 "
" 2 "
" 3 " not Tough thin
" 1 "
" 1 "
" 1 "
Perfect 1 —
" 1 Cor up

Cut Out

79 250 cc Cupree NiSoy — nothing added —

Run

1 Very bad — awful
2 OK 1 Cor up. sides imperfect.
3 OK 1 "
4 OK sides little rough — Tough Tough
5 OK no lift — Tough
6 OK 2 Cor lift slight
7 Perfect 1 cor lift faint
8 full of points, sharp, otherwise OK
9 " "
10 Perfect
11 Perfect
12 Perfect 3 corners slight lift.
13 Perfect 1 Corner "
14 bad top edge probably Sol too low otherwise OK
15 Perfect 2 Cor up top edge peeling nearly OK
16 perfect 1 Cor up much.
17 perfect —
18 perfect
19 perfect. few sharp points
20 perfect. no points —
21 " 1 lift no points
22 " 1 " large "
23 1 small —
24 Perfect
25 Perfect
26 " 1 Corner much up. Top
27 " 1 Cor small
28 " 1 "
29 Perfect
30 Perfect
31 perfect. little bad surface at extreme top
32 "
33 " 1 Cor 12 beads
34 1 Cor 5 beads
35 6 beads

80 – 250cc Cu free $NaSO_4$ 2 grms Ferric Acetate

Num

1 Very bad
2 OK
3 OK Thick Tough
4 OK 1 faint up 1 Cor – Tough
5 Perfect.
6 Perfect 1 faint lift Cor
7 Perfect
8 Perfect
9 Full of points – Very Bad –
10 Full of points Not Bad
11 perfect 1/2 doz points – Curls up when detached
12 OK Top peeled up.
13 Came off itself – 4 Cors replated.
14 OK Top edge bad peeling Sol too Low otherwise OK
15 perfect Top peeling not perfect.
16 perfect
17 perfect 3 Cor up
18 perfect 1 cor up small –
19 perfect 1 Cor up, large
20 " partly peeled
21 " 1 Cor slight
22 " 1 " some points
23 " " some points
24 " Cut Out

481 – 250 cc Cu from NaCy 2 gms Ferric Sulfate

Run	
1	Very bad
2	fair 1 cor up
3	fair, poor side edges – no turn ups
4	Sharp points, Twined up slight, 4 Cords fairly Tough
5	OK – no left – Tough
6	2 Cords up, slight
7	Perfect
8	"
9	"
10	1 Cor up slightly. Considerable points
11	perfect
12	perfect 1 Cor up – flat
13	" 2 " nearly flat –
14	" Top plating not good otherwise OK
15	perfect. 1 Core up considerably plating OK
16	perfect 3 cor up very slight
17	" 3 " "
18	perfect Whole Top ups
19	perfect. Whole of 1 side peeled away not very Tough
20	Perfect 1 cor left slight –
21	Perfect —
22	" 1 slight left – points
23	"
	Cut Out
24	perfect 1 Cor up big – Curled ups

506- 250cc Cu free, 1 Ferric, 4 grms Sulphate

Run

1 Like polished silver, thin brittle, cant strip
2 Comes off entirely - 2nd Coat, bright
3 nearly all peels off, brittle, Mirror like surface
4 bright - but all Cracked + peeled up in several rolls
5 Curled off, brittle,
6 " 2nd Coat, Rolled up, brittle.
7 whole self stripped, Curled - 2nd Coat on improving
8 Bad
9 Cracked but much improved, getting slight Matte
10 Stripped off Curled - no improvement
11 " "
12 Peeled - Considerable improvement
13 " - getting a Little matte, bottom Cracked
14. " intact, getting Matte
15 " " but split -
16 " " OK. not split, Much improved
17 " " OK peeled Easily Curled up 206
18 " " " "
19 " " " "
20 " " " "
21 " " " "
22 " " bottom peeled " 26 Gmds
23 " " " 46 Gmds
24 - Most peel 3 Corners up
25 - Self peeled 5 "
26 " 5
27 Top peeled 1/2 2 bot Cor smalle
28 3 small Corners
29 Top peeled 1 Cor bottom
30 peeled up bad Monday
31 3 Cors big 9 Gmds
32

Cg

507 250cc $CuFeEz$ $NiSO_4$ .4 grms Ferric acetal

Run	
1	OK-Tough
2	½ Curled up - away at bottom
3	Bottom loose, not Curled, not perfectly Tough
4	Perfect.
5	Bottom Curled up ½" otherwise OK
6	Perfect —
7	perfect 2 cors slight up
8	perfect —
9	perfect.
10	" 1 Cor

CO -

3 gm Ni Acetate Experiment

482 - 250 cc Cu free $NiSO_4$ 3 gr Ni Acetate 1 gm $CoSO_4$

Run	
1	Top + bottom peeked up some - Tough - OK
2	2 Corner lifted considerable - Tough
3	nearly curled up both Top + bot Tough
4	~~2~~ edge up fair plating
5	perfect one Corner up
6	perfect " slight
7	" 1 Corner up
8	1 "

Co —

3 gms Acet Ni Expt -

487 250cc Cu free Ni SO4 - 3 gr Ni Acet = 1 gm Alumn SO4

Plus

1 Dark — streaks straight up brittle Knife remove as a powder — NOTE!!

2 - Horrible —

3 Horrible —

4 — Horrible

5 Horrible -

6 Horrible

7 Horrible

8 Horrible but improving

9 Part OK but horrible still improving

10 Very much improved, I stripped it black

11 — Improved but black streaky - strip off

12 3/4 of it OK rest all OK'd improving

13 Almost Perfect - no lift — Tough, pretty

14 Perfect — Tough — !!

15 Perfect " | cor little up Tough

16 " | "

17 " — nearly self peeler

18 "

Cut Out -

Cupreous Nickel Sulfate

508 - 20 Milg dry Sulfate Alumina
+ 2 gms acetate Nickel

Run		
1	Cracked along both sides - Tough	
2 -	perfect -	Curled 1/2 off Tough
3	"	2 Corns slight, only faintly Tough
4	"	1 Cor up much Tough
5	"	2 "
8	Perfect	Tough
9	Perfect,	"
10	"	1 faint Cor up
11	"	
12	"	1 cor up bottom
13	"	1 Cor up bottom big
14	"	3 "
15	"	2 Cor top + bot
16	perfect	
17	perfect	
18	Perfect	
19	Perfect	
20	"	
21	"	
22	"	
23	"	

Cut Out

485 250 cc NaSO4 - 2 acetKi - 1 gram FerricSO4

Run

1 ½ Curled off, Edges fine cracks, not Tough
2 peeled off
3 OK 2 ~~[illegible]~~ Cor up Tough
4 fair 3 Corr up -
5 Curled up - Not very Tough
6 perfect. Top peeled $\frac{1}{8}$" not tough
7 " Top + bottom up Considerable
8 Curled up nearly all over frame cracks Cracked.
9 Curled away - left scarcely tor
~~10~~ Self peeled
10 tops big 4 Corrs
11 Self peeled
12 nearly self peeled
13 bottom turned up - Top 1 Cor
14 Perfect — points
15 " 2 Corr up
16 " 2 " slight
17

484 250 cc $NiSO_4$ – 3 gm acetic acid 1 gm $CuSO_4$

Run

1 Very bright fine Edge cracks Copper color?
2 flat but warts & cracks not bad No Cu Color
3 black flocculent warts streaks thin
4 black " " Streaks Cu Color Tough & slight
5 " " " " No improvement
6 " " getting worse??
7 " " Still bad
8 " " Awful bad green
9 "
10 " — no bubbles
11 " No improvement
12 " Worst yet — Horrible
13 " Bad yet
14 " Still bad
15 " Awful —
16 " Bad
17 Better —
18 " — Bad
19 much better
20 Worse
21 6 Gmds — only few black streaks
22 bad yet
23 bad
24 "
25 " improved
26 bad again
27 bad
28 bad
29 bad
30

Cut Out

483 - 250cc Mbaq - 3gm Acetal Ni 1gm Zn SO4

Run	
1	Came off self - not tough, Mirror bright
2	1 layer peeled
3	Mirror - all bad Brilliant "
4	nearly whole - Brilliant Mirror self peeled
5	" not so Brilliant improving
6	Intact but all fine Cracks
7	" streaks - getting bad, Mirror [illegible]
8	Curled & Cracked peeled, fine Mirror not improving
9	" " "
10	" " "
11	" " "
12	" " "
13	" " "
14	" " improving slight
15	" " Much improved
16	Self peeled, intact except at heavy bottom hole no d, fairly tough, Same Mirror
17	About same - Mirror
18	Improved. stopped at nearly intact
19	Same as 18
20	about Same
21	nearly intact. 2 bands Mirror
22	Intact Mirror
23	" " holes
24	" "
25	nearly intact
26	Completely intact, holes + streaks
27	getting matte 6 bands
28	2 Cor up has holes (bubbles) - getting matte
29	bad

CO -

488 250cc $NiSO_4$ 3 grms dect Ni 1 grm $MgSO_4$

Run			
1	self shapped		
2	4 Cors up	much	Tough
3	3	"	"
4	2	"	"
5	2	"	
6	1 Cor up	slight	"
7	Perfect	few sharp points	
8	one whole side Curled	"	2 Cors up
9	all 4 cors Rolled Concave		
10	self shapped Curled - puffed on		
12	1/8" of Top up		
13	1 Cor up -		
14	Perfect		
15	"	1 corner	
16	"	1 Cor	
17	"	1 Cor	
18	"		
19	"	2 Cor up slight	
20	"	sharp points	
21	"	few " "	9 Ends

y 89 25 Dec 1904 – 3 grms Acetate Ni 1 grm Ammonia SO_4

Run	
1	self stripped – fair
2	Cracked around all on Cathode brittle
3	" "
4	self peeled "
5	Intact but Cracked at Edge brittle
6	2 Cor lifted much not tough
7	4 Edges up not tough
8	all Crack on sides
9	all peeled from sides nearly
10	Cracked Edges, lifts brittle
11	" " "
12	" " "
13	" " "
14	Cracked at Top only at sides
15	" " " " brittle
16	perfect Top 2 Cor up smooth
17	Sides Curled up — 2 Bends
18	"
19	Top 1/3 peeled up 1 bottom Cor bag up
20	3 Cor up Cracked sides 2 bends
21	2 "

491 - 250cc Nutsoy Cultura 1 gm Cerous Sulfate

Run			
1	PERFECT	Tough - no edges up.	
2	Perfect	"	
3	"	1 cor up	
4	"	3 "	
5	"	1 " big	
6	"	2 Tap Cor up much	
7	"	3 Cor up -	fine Color
8	"	1 cor	
9	"	1 Cor	
10	"		
11	"		
12	"	1 Corner faint	
13	"		
14	"	1 Cor up	
15	"	1 Cor up	28 beads
16	"		10 beads
17	"		Very white.
18		1 Cor	" 10 beads
19	"		"
20	Perfect		"
21	"		
22	"		

Cut out,

09 - 250 cc Cupric N_1SO_4 - ½ gm $Al_2(SO_4)_3$

Run

1 — phenomenon — mass of little balls — scrapes off to a powder by knife —

2nd dark — scrapes off in powder

3 " " no improvement

4 " " "

5 " " but great improvement

6 " improving

7 " " "

8 " " " scrapes off easy

9 " " Hard to scrape off still improving

10 Bad again

11 " " Not good

12 "

13 " not good

14 Bad

15 Bad

16 Bad

17 "

18 "

19 "

20 "

21 Hopelessly Bad

22 —

CO —

493 250 cc H_2SO_4 1 gm Manganous SO_4

Run nearly self chipped, Curled, not tough.

1
2 2 Cons up Tough
3 Tops curled up - 1/8" of Tops left Evenly
4 4 Cons up
5 3 "
6 Top & bottom ups a little.
7 " + 3 Cons Long
8 2 Cons Top, much
9 perfect
10 " " 2 Cons up
11 " 2 "
12 " 2 "
13 " 1 "
14 " 1 "
15 1 "
16 1 " 7 Bends

CD

Sample from 10 Bad A6 — 135 amp H
Regenerated in 12 hours —
Sent to Bat Co Dec 10/19 for test. — 1233 both cells on 3rd
Run this is even better than
Current regular M. (OH) —

We find that the reduction is quicker & more even when 20% NaOH is used with glucose than when 10% NaOH is used

90. 250cc NaOH — 1 gm Cadmium Sulfate -

Run

1 — Black warts, cant strip

2 " " not as bad

3 " " just as bad

4 " Lumpy, gelatin cant strip

5 — Zinc color " peeled — Cinnabar color / brittle

6 " "

7 All peeled, warts gone — Zinc Color

8 Cracked — black around Edges Bad

9 all Cracked, Color Zn Like

10 " "

Cut Out

511 Continued -

2R perfect 1 Cor up

75' 22 " Thin

8

Cg

511 — Cu first Nebsy big crack — Alright taken out by Ba Boy [illegible]

Run

1 - ok but Curled up, tough - not very tough

2 Perfect 1 Cor up -

3 Curled up from sides not tough
Come loose early

4 2 Corners, Curls 3 bends fair

5 2 Cors up 3 bends -

Think 511 + 510, small work ok for gall on 5th - 511 best.

6 Perfect — Soft Tough

7 " 3 Corners up - Cracked 2 bends

8 3 " 2 bends

9 Perfect — ok gall 2 bends

10 " 1 Cor up — 3 bends

11 2 Cor up 1

12 Perfect —

12 Perfect —

13 " 2 Cor up

14 " 1 Cor

15 "

16 " 4 Cors up

17 " 1 small Cor

17 S. Poor 3 Cor up 2 bad Monday

18 ok 2 Cor 1 big

19 Perfect —

20 perfect —

21 " 2 Cor up - cold

22

See Boughley

This is said in big Creek record

510 - from big bath Cu —

Run

1 - All cracked terribly & brittle

2 " " "

3 fair - turned up at 4 Cors down improving fairly tough -

4 - 2 Cor up Cks on 1 side 1/4 " 3 cks - 5 bends

5 2 Top Corrs up 3 bends -

6 bottom peeled - 2 Cracks at top

7 4 Cors up - tender land Curve up broke 1st Bend -

8 3 Cor up 3 bends

9 1 Cor big 4 bends

all 10 Perfect - 2 Cors 3 bends

11 " 3 Cors

12 " 1 Cor

13 " 3 Cor up -

14 " 2 Cor very faint -

15 " 3 Cor up

16 OK

17 " good - but 3 Cor up little Moldy

18 " 2 Cor small -

19 " 1 Cor fine -

20 " 2 Cor up

21 " 3 Cor 1 big

22 " 2 Cors small -

23 " "

24 " 2 " thin

25 "

26 "

27 "

Processing

512 - Cut out big sol. neutralized

Run

1 Cracked slightly like saw along 2 edges. 1 Cor left much promising for 1st Run fairly large, 4 bends -

2 1 side curled up - other top Cor curled than usual, soft - 12 bends - Thicker

3 4 Corners Curled up big 2 bends

4 4 Corns up - Cracked 3 bends

5 4 Corners Sides peeled up 5 bends

6 2 Cor - 3 Cracks in Top -

7 Perfect 2 Top Edges up

8 " 2 Quite Tops 4 bends

9 " 2 Cors 1 crack dull

10 " 1 Cor up big

11 " 1 Cor up - after gall - 5 bends

12 " 2 Cors up 1 bad

13 " 1 Cor small -

14 " Crack - peeled bad, monday

15 " 2 Cor big 1 Cracked

16 " 5 Bends

17 " 2 Cor up small

18 " " large

19 1 Cor up big

20 " small

21 2 " up

23 14 " 2 Cor

CO -

511 Dup — Same as 511 but Peroxide
Boiled off —
Run

1 Cracked top Curled up Trough
Curled Early 5 Beads

2 4 Corners up. Cracked 4 Beads
3 " " "
5 1 Cor up — 3 Beads
6 3 Cor up · Crack at top 5 Beads
8 perfect. 2 Cor up
9 " 2 Cor up Off forgot 10 Beads
11 " 3 Cor up —
12 " 1 Cor small
13 2 Cors large 1 small monday
14 " 2 Cor up.
15 " 1 Cor up big
16 1 3 Cor up
17 1 4 Cor — change powders
18 2 Cor "
19 1 2 Cor 2 up "
21 1 2 " no powder
22 1
23 "
24 1 Cor up

513 - Dougherty

1st	whole top peeled 1/2		6 Gentle
2	4 Corners big		4 [illegible]
3	4 " big		
4	3 " big		
5	perfect	3 Cor up 1 big	
6	"	3 Cor up small	Obliqs
7	"	2 Cor. considerable	
8		1 Cor. "	
9	Poor	badly peeled & cracked Monday	
10	"	"	"
11	fair	1 Cor. 1 Crack brittle very Thin	
12	Poor	2 Cor 2 Cracks on sides	
13	fair -	4 Cor up 1 Crack	
14	"	"	Second Crack
15	Perfect	2 Cor big Thin,	
16	"	2 " big	
17	"	2 Cor up	
18		2 Cor	Thin
19		2 Cor	V Thin
20		2 Cor 1 big	Cracked sides
21			

514 Doughlin

1st 2 Cor big peel up 3 bends

2 " peeled entirely from Endpoint in C Cor 3 bends

3 nearly all Curled, late

4 perfect 2 Cor up at top considerable

5 " 4 Cor up

6 " 3 Cor up 2 big

7 " 3 Cor, sides peel up some 1 sid

8 3 Cor otherwise OK ✓

9 Poor peeled + cracked Monday

10 " "

11 perfect 1 Cor big lip (thin) - 3 bends

12 " 4 Cor up small

13 "

14 " puffs up — no Cor

15 2 Cors no puff up

16 3 Cors Cracked 2 places

17 4 Cor up

18 blisters 1 Cor

19 quite thin

20

21

22

Dec 13/19

Moore Regeneration #413
using 20% NaOH,

$Ni(OH)_2$ green

Edison #3 sent Dec 13 to
O'Neill for test.

501 250cc Cu out - 3 Mlg Mercurious SO4

1st Cracked up terribly

2 Edges all around bad

3 puffs - 2 Cor big 8 bands

4 Perfect 1 Cor up 7 bands

5 blisters 3 Cor up

6 Perfect 2 Corners

7 " 1 Cor

8 " 2 Top Cor

9 "

10 " 1 Cor up

11 2 Cor up

12 1 Cor up thin

13 2 Cor up

14

15

505 Cwt free 1 lb 04 5 lb 1/4 Ag 8 04

1 Cracked up terribly
2 fours - 4 beads but bad at edges
3 perfect. 1 cor. 7 beads
4 " 1 Cor up big
5 " 1 Cor up big 8 beads
6 " 2 Cors 2 or 3 points
7 1 Cor up
8 " sharp points
9 " 1 Cor up big
10 2 Cor up big
11 puffed blisters 1 ends turned up
12 2 Cor up no blisters thick
13 1 Cor up. ~~[illegible]~~
14
15

Ni Solutions of all kinds seem to want 60 amp hours of Nickel plated hours per gallon of solution before they are tough + flexible —

300 gals requires 18000 amp hours requires 105 baths running 24 hours - probably 75 baths 2 hours would answer when sol was nearly OK — 7½ Cu out No 8/4 + Ni plated + saved to be plated on again changed sol produce brittle veneers at future times 75 disc thus could be used as cleaners permanently —

15 Bug Crack 250cc Cultre = 1hr 04
1 gram glucose
= Sh. ripped nearly in family Eaten by 3rd Ward
2 Curled up Cracked
3 " "
4 " "
5 " "
6 " "
7 " "
8 " "
9 " "
10 " " improving
11 " " "
12 " "
13 " "

516 - Big Creek Cutfree, MS04 -
10 cc mg dip 8/4

1 = Horrible all cracked up + yellow
2 Slight improvement
3 Still horrible -
4 " "
5 " "
6 " "
7 " "
8 " "
9 " " improving
10 " " improving more
11 " " " V brittle
12 Cracked up - improving
13 Still Ck'd - improving 1 Minor 2 Crack Minor
14 1/2 dog Cks Very much improved
15 OK Except 1 ck at top Cor
Very brittle, tears in stripping 26
16 OK - 3 Cor up 2 big - Middle
16 5 Cracked - Edges up big 4 Cracks
17 Top peeled up Matte Springy
18 " "
19 2 top Cors -
20 3 Cors - thin 1 Crack
21 3 " 1 big
22 2 up - big - Curled
23 2 "
24

Co

517 - Big Crock Cedrus atlantica - Hi Sog
10 gram plate chest.

1 = Stripped very early, brittle.
2 much improved
3 Improved 4 Cor 1 very Cramp
4 " Cracked 1/4 peeled
5 - Nearly OK 2 Cor big 1 small 2nd bad
6 " 4 Cornu
7 All cracked up very bad
8 "
9 " improving
10 3 Cor up by slight peel 1 side 3 end
11 Cracked stick
12 good. Top peeled little
13 perfect
14 - 4 Cors up - 4 Bend
73° 15 2 Cor top up
17 2 Cor Cracked at top then
18 2 " big
19 3 Cor small - 1 bend
20 3 1 very big 2 small -
21 3 Cor 2 big.
22 4 Cor all big
3° 23 2 1 big
4° 24 2 up

CO

Reg NiSO4 Conc + crystalized - Crystals drained in filter pump, washed Cold water, redissolved in distilled H2O to sp g 1.29 at 24° - filtered

518 Dougherty's CP NiSO4 - Everything out

1st Horrible all Cracked in thousand pieces
Red Edges — anode Red
2 Improved - Red Edges
3 Perfect ——— 3rd Gen
4 " 1 Cor up - points, gas holes
This is all full gas holes like a sieve
5 Perfect ——— 2nd Gen
6 " ——— 4 Gen
7 " 2 Cor ups thin 2 bends
8 2 " faint 12 Gends
9 " ——— blisters
10 ——— "none"
11 ——— 8 bends. thin
12 ———
13 ———

519 Continued

~~5th~~

20th 3 Cors 1 1/2"

21 2 " 1 big

22 1 up big

C_2O_2

519 – Cupree big BaS – Fe oxidized by BaO2 (very small amount)
free acetic acid neutralized by very large amount of fresh
$Fe_2(OH)_6$. left small amount
free acetic in Electrolyte Specif 1265
Room temp

Run 1 3 Cor + Cled good for 1st run
2 Sides peeled up 1/8 @ 1/4 – Check
3 1 Side peeled up a little. improving
seems quite Check 2 Bends

4th – peeled + Cracked
5 "
6 "
7 2 Cors big – improving fast thin
8 – Cracked + Side 1 big Cor
9
10
11 2 Cors 3 Bends
12 2 "
13 3 Cors + big –
14 1 Cor up thin
15 2 Cor up
16 1 Cor, Umbrellate
17 1 Cor big
18 3 Cor
19 3 Cor – 2 very big Curled

93 – 2 Cor Sieve

29 – perfect — Sieve
30 " no holes
31 " "
32 — flat No holes few points
33 " "
34
35 76°
36 80° Sieve
37 – 70° No holes points 15 Beads
38 70 "
39 "
41 OK
40 Sieve
42 OK
43 1 Hole
44 OK
45 Several holes
46 OK
48 Sieve only on Hard point
49 OK
50 OK. defect holes
51
52 OK
53
54 OK
55
56 OK
57 OK

24 hours 3 o-o

58 OK thick
59 3 Cor "
60 1 Cor "
61 OK "
62 OK "

63 OK
64 all Sieve
65 OK
66 OK
67 OK 1 hole flat
68 OK
69 OK 2 holes
70 OK
71 Sieve
72 "
73 1 cor by Sieve
74 OK
75 OK
76 defect
77 OK
78 OK
79 OK
80 Sieve
81 OK
82 OK
83 OK
84 OK
85 OK
86 OK
87 OK
88 OK
89 OK
90 OK
91 OK
92 OK

520 Doughlery CP Recrystallized Nov 4 once
No addition

Run
1 All cracked up.
2 2 Cors 1 big Nearly OK 15 beads
3 1 faint Cor 20 beads
4
5
6 1 faint Corner 12 beads
7 94 OK 5
8 95 OK Thin
9 96 Sieve
10 97 OK
11 98 OK
12 99 OK 3 Beads
13 100 OK
14 10 "
15
16
17
18
19 35 beads
20
21
22
23
24 200 much holes
25
26
27
28 35 small no holes

Continued

521
25 — perfect flat
26 "
27 "
28 " no holes — better than 30 bad
29 Sieve full holes
30 " 1 hole
31 1 hole
32 no holes
33
34 75.7 no hole
35 77 "
36 80 "
37 70 — no holes
38 "
39 — 2 holes
40 OK
41 OK
42 OK
43 OK 1 hole
44 OK OK
45 115 OK
46 OK 1 hole
47 OK 35 bends
48 OK
49 OK
50 OK
51 OK
52 OK

74 = 2 Cor up 1
75 OK
77 OK
78 Sieve
79 OK
80 OK
81 Sieve
82 OK
83 OK
84 OK
85 OK
86 OK
87 OK 78
88 OK
89 OK
90 OK
91 OK
92 Sieve
93 OK
94 OK
95 OK
96 OK
97 OK
98 OK
99 Sieve
100 OK

53 — OK
54 5 — OK
56 — OK
57 — OK
2 Hours 300 M

58 OK 1 hole
59 3 Cor. "
60 OK flat
61 " "
62 " " 1 hole
63 " "
64 Sieve
65 Sieve
66 OK
67 Sieve on green
68 OK
69 OK Shaken 2 hr
70 OK
71 OK
72 OK
73 2 Cor OK
74 1 Cor OK

521 - Same as 520 added 1 cc
Acetic Acid —

Run
1 — perfect - 3 Cor up 2 bad 4 bends very thick
2 " 1 Cor up liq mod thing 9 bends
3 " 1 Cor up - small C 17 bends
4 " blisters
5 " 7 bends thin
6
7 " 4 bends
8
9
10
11 with tight & nolico full holes
12 3 bends 15 ft not pulled
13 few gas holes thin.
14 nearly flat
15 2 bubbles
16 3 "
17
18 lots points — full of gas holes
19 Phenomenon just like a 200 mesh sieve
Think it must be very even
holes are due to attack + disolving +
not to any gas bubbles
20 only 1 or 2 holes 1 Cor up
21 points 12 bends
22
23 points 40 "
24 no holes 36 "

522 Dougherty – Mother Liquor SG 1.295
from Crystallizing CP (alleged NaSO4) 1 collectic
1 = Horrible Cracked up
2 Impressed partly chipped
Cracked, pit, Eclipse
3 = 2 Cor big ½" turned up (or curled up)
but generally OK curled Entirely 2nd Bend
4 good 1 Cor 2 bend
5 2 Cors up big
6 1 cor up big 2 bend
7 2 Cors up 1 big
8 2 Cors 2 big 1 bend
9 2 Cors up
10 3 "
11 4 1 very big not flat
12 4 up small Curls only little
13 2 = 1 big "
14 OK –
15

CO.

Regeneration -

100 lbs anode mix from Luters

yields

Nickel hydrox	51 lbs
flake over 40 mesh	3
" fines -	4.7
Ni Sulfate -	6.5
	8.8 %

Sludge

which contains -

7.3 lbs Ni (OH) -

1.5 Fe (OH) 3

494 240 cc Cu free 1 gm Stannous Soy

1st - 2 ~~Edge~~ Cors big -

2 OK 2 Cor up big

3 perfect 2 Cor big somewhat 3 [illegible]

4 " 2 Cor very big 5

5 " bottom up 1/3 14 not pulled

6 2 Cor Curled Consumable

7 2 " Crooked

8 bottom up -

9 - 1 Cor - but -

CD.

496 250cc Cupfuls, 10 Milg Arsenious acid

1st all cracked horrible

2 3 Cor – cracked slightly

3 perfect 3 tiny Cors | 3 brand

70° 4 2 Cor 1 big

5 2 " small

6 2 Cor Curled a little

7 2 " 1 big — flat 4 brand

8 1

9

10

CO

499 – 250cc Cu free 10 Mily Calcium SO4

1st Cracked a edges 1 under 6st rest OK

2 Cor up 6 bends

71° 3 Perfect 1 cor v small 1st Bend

70° 4 1 " 8 "

5 1 surface fine 1 at 30 bends or more not pulled

6 3 cor early dry warts – 2 Cor big Curled little

7 4 Cor 1 big 1 bend

8 2 Cor

9 OK

CO

500 2000cc Coupee 2 Melg dead Dog

1st	all Cracked up Lad		
2	perfect	1 corr up small	3 Gends
3	"	3 tiny Corrs	2 Gends
4		2 Corrs	4
5		3 Corrs up just barely thick	12 not pulled
6		2 Corr	Curled
7		2 Corr	nearly flat
8			
9			

CO

Continued 523

28
29
30 Sieves
31 OK
32 OK
33 OK
34 OK
35 OK 3 holes
36 OK
37 OK 1 hole
38 OK 24 bends
39 OK
40 OK
41
42 OK
43
44 OK — full holes
45 OK
46 OK
47 OK
48 OK some holes, 1/4 slip thick-clear

40 bends
73 OK
74 OK
75 OK
76 OK
77 OK warm
78 OK
79 OK
80 OK
81 OK
82 OK Thick
83 Sieve
84 OK
85 Sieve
86 OK
87 OK Clear
88 Sieve

4 2 Hours 300 MA

49 Thick some phenomenon at Top
50 OK - Thick
51 OK " dead float
52 OK " "
53 OK " "
54 Sieve
55 Sieve
56 Sieve
57 OK
58 OK 1 hole
59 OK
60 OK
61 OK
60 OK — thick

61 - OK
62 Sieve
63 OK
64 OK
64 OK blisters
66 OK
67 OK
68 OK
69 Sieve
70 OK
71 OK
72 OK

523 250 cc CP $NaOH$ (twice recrystalized)
glacial = 1 cc Acetic Acid -

1st PERFECT — Bendo 30 Times
2nd " " "
3 "
4 bendo 20 or more of not pulled
5 few holes Curled — little
6 no holes
7 1 hole
8 no hole
9
10 1 cor 11 bends
11 Phenomenon 200 mesh like Eaton.
12 " same thing
13 only few holes — 13 Bends
14 OK no holes
15 1 cor no holes
16
17
18
19 several holes 30 bends
20 no holes
21 1 or 2 holes
22 1 Hole
23 no holes
24 full holes Sieve
25
26 no holes - some pounds
27 no hole or pounds

497. 250 cc NrSoy Cultura no acetic
10 mg - chromic acid

1st Run — All Cracked up

2 — ok but bad have cracked Edges 25 bend
Thick platelets at bottom thin at top —

3 — ok. — bottom up a little Tough

4 — ok — Top up 2 1 by Very Tough

5 — " — 2 Cor 1 hole

6 — " — 2 Cor 1 hole. 4 bend

7 — " — 1 Cor up

8 — " — 2 Cor up

9 — " — perfect — points

10 — perfect. no points 7 bend

11

CO —

525 From Galls beg Crock 2 qr ferric hydrox

1 - Curled up bottom & top
2 " Sides Evenly
3 "
4 " 1 Cor beg - Cracked sides 4 beaved
5 - " ~~Cracked~~
6 3 Cor 1 Ck - 1 Cor peeled
7 " full Eatin holes -
8 2 Cor up - Reg Seirs 200 mes

CO

524 – 250 cc from 4 lb big crock 2 g boric form
of calcite

1 = Curled + left Cathode – 2 only
2 only little Curled but C'd both Edges 8 + 4 g
3 Curled + Cracked 12 Gram
4 perfect — 4 Gram
5 1 Cat – 200 Mesh Sieve
6 Cracked + peeled no luster
6 – "
7 2 Cons
8 Perfect
C.O.

526 Mother Liquors from 5214 523
boiled down & Crystallized Crystals
made up to 1250 cc Sp G 1.255 —
1 cc acetic — Not mother liquor but extra
Crystals from mother

1*	4 Corn up 2 bag		9 Grams
2	perfect, 1 Corners		15 Grams
3	"		
4	"		
5	"	Calin. grooves separate with Thumb	
6	"		O/C no holes flat 13
7	"		full holes
8	"		full holes
9	points		no holes
10	no points		1 hole
11	points		no hole
12	" few		1 Hole
13	"		no hole 1 fourth
14	none		"

CD

527 = 2500 W/Soy Cu free 20 mlg
Telluric Oxide from Baltimore

1 = All Cracked & peeled
2 Much improved Cracked | 26 Grams Eclipse 4 to 5"
3 Nearly perfect Very few Cracks or no Eclipse 15 Grams
4 Still more perfect Top up 1/12 no holes
5 perfect, 2 Cor small 6 Grams
6 " 2 Cor up Top – 1 hole
7 full isolated holes
8 — no holes 6 Grams
9 — " 12 "
10 4 Cor up small
11 3 " "
12 Whole top 1/2 up
13 2 Cor up

CO

504 $MnSO_4$ Cu free 10 Mlq Thallium SO_4

1 – Cracked up

2 Much unpressed

3 1 Cor up big 200 Mesh Sicor

4 flattened 1 Cor –

5 " Flat no points or holes 6 bends

6 " flat – no holes or points Thick Tough Cor " bends

7 " 2 Cor up — bent few holes

8 2 " Sierra

11 – 1 Cor up no holes

CO

502. NaSoy Cu free 3 mlq Platinic SO4

1	Horrible		
2	90% OK	78° Fah	18 bends
3	perfect		6 bends
4	"		5 "
5	"	flat.	13 "
6		2 cor flat	21 "
7		many holes	
8	dead flat no holes thick		
9			
10		2 Cor up	
11	OK	1 cor up	
12	OK		
13	OK	3 Cor up	

Co

486 – Mt204 Cu free 1gm ferric sulfate

1 all cracked up
80° 2 " peeled up but intact, peeled [illegible] 7 days
75 3 OK 3 Cor 1 hole
80° 4 Self peeled ⓪ Sieve
70 5 1 Cor V bug
6 3 Cor 1 bff
7 1/2 peeled
8 1/4 "
9 3 Cor bug
10 4 Cor cups bug

CO ?
CO

528 - 3rd Recrystallization 80°7 no acetic

1st. Sides turned up 1/16 bottom peaked up 12 bends
1/16 -

2nd perfect — top slight up 34 bends
3 " flat — 38, 40
4 5 " flat -
5 "
6 — two holes
7 OK 1 hole
8 OK
9 OK 28 bends

CD

495 – Nelson Cu free 1 grandson left

1 = Cracked up not bad

2 4 Cor up 4 beside

3 3 "

4 OK flat

5 OK "

6 Top up bottle

Co

498 – McBoy Cupren 5 Mil (gal)

1 bad cracked

2 ~~perfect~~ 2 edge up curl of Cat 46

3 nearly " 4 " up

4 Sieve bad

5 OK

6 OK but edges not perfect at lip

7 OK " " round

8 CO

492 McCoy Cupreous 1 gram Chromous
50¢

1 = OK except 1/16 of Edge apparently bad 3 times
2 Improved - flat 17
~~3~~ OK no Comments 24 bad
4 OK = few holes
5 OK Edge not quite OK yet
6 OK " " Curous
7 OK " " 4 bewares
8 OK " " "
9 OK " "
10 — Very bad - deep [illegible]
11 — 2 cor 3 Holes Edge little bad
12 Several holes
13 — black at bottom
14 All green

C O —

28 = 1/2 dropped V thin
29 8/10 " V thin
30 ok - few holes thin
31 Sieve
32 OK
33 OK
34 OK
35 OK
36 OK
37 OK thin semi
38 OK "
39 OK
40 OK
41 Sieve
42 OK
43 OK ~~[illegible]~~ in air
44 OK
45 OK fairly thick
46 Sieve
47 Sieve
48 OK thin
49 OK med thin
50 OK "
51 OK
52 Sieve
53 OK

CO

Electrolytic Anode

529 — 250 ml soy 2nd Crystallin, 7 g of Cu out
Electrolytic Anode

1st. All peeled up + cracked
2 OK — Sieve 4 bends
3 OK
4 OK 18 "
5 OK Very fine grain, no cupolas
6 OK Sieve
7 OK Very thin -
8 OK "
9 OK Very thin cant strip 10 hole, bridge wall, delaminate
10 OK " 9/10th strip [illegible]

2 Hours 300 ma

11 OK thin -
12 1 Cor up thin strips ok but thin
13 OK — thin "
14 OK " few holes
15 OK " "
16 OK cant strip
17 Cant strip. only little Sieve
18 Strips OK 1 hole - thin -
19 Sieve —
20 OK no holes thin
21 OK 2 holes thin
22 9/10 strip 2 holes "
23 OK strip OK 1 hole "
24 Sieve
25 Cant strips
26 Cant strip
27 " Seems circular anode = 3

Note 529 – 530 bath.
Electrolytic anodes bath
gives Sieves 26th Dec in morning
behaves as old anodes. Same
time gives OK deposits –
What Connection ? ? SS

530 - 250 cc $NiSO_4$ 2nd Crystals at Cu Fe out
Electrolytic Anode 1 cc Acetic acid

1 = OK. 2 small Cor. up 12 bends
2 Sieve fully
3 OK
4 OK
5 Sieve
6 Very Thin – hard to strip
7 OK Very Thin
8 OK Very Very Thin – "
9 OK Thin
10 OK blistered

Electrolytic anodes gives much thinner deposit.

~~2 Hours 300 ma~~

11 OK
12 Sieve on minute Thin
13 some holes about 1/3 right thick
14 " " "
15
16 " " 1/4 "
16 Cant strip
17 Strips OK Thin 2 holes
18 Cant strip –
19 Stripped Sieve
20 8/10 Stripped – 5 holes Thin
21 OK – several holes
22 OK – "
23 Cant strip several holes
24 Strips OK no holes

CO

31 Same as 530 only using old anodes —
1st 1 Cor big
2 OK —
3 OK quad
4 OK 9 bends
5 OK
6 OK — points 6 "
7 OK Reg thickness 1 hour 300 MA.
~~2 Hours 300~~
8 OK OK —
9 4 Cors up 1 big thick
10 2 " very faint flex
11 OK
12 OK thick —
13 OK " several varying holes
14 OK " 1 hole
15 Sieve
16 OK
17 OK
18 Sieve
19 OK
20 OK - blister, thick
21 OK thick
22 Sieve,
23 1 Cor — Sieve thick
24 OK
25 2 Cor OK
26 OK
27 OK
28 OK
29 Sieve
30 Sieve
31 OK

32 OK
33 OK
34 Sieve
35 OK
36 OK
37 —
38 OK thick
39 OK "
40 Sieve
41 OK
42 Sieve
43 OK
44 OK thick
45 OK Mod thick
46 OK "
47 OK
48 OK full holes ~~Good up to 6~~
49 OK
50 OK
51 OK - 1 Cor
52 OK
53 OK
54 OK
55 4 Hours 300 MA
55 OK nearly flat, 2 Cor small
56 OK flat
57 Sieve
58 OK
59 OK
60 OK
61 OK

Dec 26/19

Regeneration of Old SB Cell mix
The 20% Sol with glucose cant be
used again as it gets thick & sluggish
We will Evap down & bring it
up in temp to burn out the
Organic Matter —

~~32~~ 11 — ok Thin - spongy
12 — 1/2 strip
13 ok Curls thin
14 Sieve
15 ok V Thin
16 ok
17 ok Curls, ~~[illegible]~~ "
18 — ok " " "

Now put Electro, ignited anode in fresh 2 Crystal sol —

1 = Cracked up
2 ok flat, ~~[illegible]~~ Thick - 2 cor slight
3 Sieve
4 ok Thin —
5 ok "
6 ok "
7 ok "
8 ok " holes
9 torn "
10 ok —
11 ok

CO —

532 Nibs - 2 Crystals 1 cc #2 504
Electrolytic Anode

1 = Very thin - had to strip 1 hour 300 ma
2 Hours 300 ma
2 stripped ok - about as thick as Reg 1 hour
3 ok Sieve on bracket part
4 ok no holes Thin
5 ok Some holes, Thin, piece stuck
6 ok 1 hole "
7 ok Several holes Thin
8 ok " "
9 ok
10 ok torn little in stripping - thin
11 ok 3 or 4 holes
11 ok 1 hole, blisters V Thick
12 Sieve
13 8/10 stripped ~~[illegible]~~ holes V Thin
14 Sieve 1/2 strip —
15 ok 3/4 strip

Will now neutralize Completely

after Neutralized —

1 = all cracked up —
2 4 cor up all Sieve Thick
3 ok 2 cor up
4 ok blisters
5 ok ~~thin~~ fairly thick
6 ok pretty thin
7 ok
8 8/10 stripped
9 ok 8/10 stripped
10

~~S1 H2~~

133 Nisoy 2 Crystals 3 cc H_2SO_4
Electrolytic Anode

1st Can strip only 1/2 = Very thin. 1 hour 300 Ma
2 Torz no stripping 2 Hours Very thin
4 OK several holes! Very thin 1/4 Thin
5 only 1/2 stripped
6 " 3/4 " Sieve
7 Torz - very thin. 2 holes
8 " " 2 "
9 Cant strip
10 stripped 8/10th - Spongy
11 1/2 stripped / Sieve
12 OK
13 Put platinum Chl on cathode —
darkened cathode, coulstat peal
14 Cant strip Very Cleaning
15 " " " "

CO

24 1/2 strip —
27 2/3 strip
28 1/2 strip thin
OK thin
29 8/10 "
30 OK "
32 OK " Curls
33 OK " "
34 Sieve

Put unignited Electro Anode into fresh 2 Cryst Sol.

1 = Cracked up
2 OK. 2 Cor slight thick.
3 OK —
4 OK mod thin —
5 1/2, Sieve thin
6 1/4 strip, thin
7 1/2 " "
8 OK V thin
9 Sieve
10 OK — V thin

CO

534 N Soy. 2 Cryst 6 cc H_2SO_4
Electrolytic Anode
1st Too thin to strip — 1 hour 300 MA
2 Hours 300 MA

2nd just managed to strip 5% Very V thin
3 Cant strip too thin —
4 "
5 OK. Thick — Strips Reg. Thin
Solution Green neutralized so dilution barely red — Cores OK —
6 — Sieve not reg thick
7 1 Cor up. Holes, 2 or 3 holes
8 Sieve thin
9 OK 1 hole Very thin — Thesis 156 Ends
Curious —
10 OK 4 holes Thin
11 OK 1 " "
12 OK 1 " "
13 OK 1 "
14 Cant strip, Sieve
15 OK 1 hole thin
16 Cant strip — Sieve
17 stripped many holes
18 " 3/4 — thin
20 3/4 — "
21 Cant strip
22 OK
23 OK
24 OK. Curls
25 OK "

~~1 Hour 300 MA~~

535 N Soy 2 Crystn 12CC H_2SO_4
Electrolytic Anode
1st Too thin to strip — 1 Hour 300 MA.

2 Hours 300 ma

2 plated but too thin to strip only a brush
3 Cant strip VVV Thin
4 Covered o.k. but too thin to strip
5 Plated but Cant strip
This was an old anode
6 Cant strip —
7 "
8 "
9 "
10 Stripped 1/2 Exceedingly thin no holes
11 Cant strip —
12 "
13 1/2 stripped

Trying 600 MA density
after several hours it plates
thick but think it not
very good no holes seen
but evidence next 5/4 seems
poor & its full of powder

CO

Dec 27/1919

Phenomenon

With an almost saturated solution of pure NiSO4 - The thickness of the deposit seems to be contracted by the efficiency of the anode. One would think that there was plenty of Ni in the solution even if Anode was only slightly attacked to plate out regular thickness. But it dont act that way. I use 300 MA on 2 square inches surface cells with old rolled sheet nickel in series with cells with Electrolytic anodes The old sheet Ni anodes plate reg thick while Electrolytic anodes give 1/2 the Thickness. It looks to me as if my theory of appearance of acid & base at Cathode simultaneously was correct + not the theory of base at Cathode + acid at anode or the old theory may be ok & the anode radical may not react to dissolve Ni + prefer to give off O. yet there is no count of Ni adjacent to Cathode ??

As Nitrate of Ni always deposits the hydroxide, on Cathode it looks as if the thinner was due to deposit of Metallic hydrox & SO_3 at moment of release of Ni turned round & dissolved the $Ni(OH)_2$ thus making it thinner, or the free acid in Electrolyte - of no free acid deposit tend to have $Ni(OH)_2$ on it —

Jany 2 1920

We have thus far taken from the

Cell containing 1500 cc $NiSO_4$

~~of Nickel~~ & 60 grms Nickel Acetate

Using rolled sheet Ni - 2 plates Each weighing 275 grams without changing solution in any way Except addition of water - plating is good - will continue plating to see how long it will last

No 1	274
2	267
3	
4	

4 = OK mod thick
5 Sieve
6 Sieve
7 OK - mod thick
8 OK "
9 OK "

Co

2 Hours 300 ma

536 - 2 Crystals N.S.04 -
using 3 Electrolytic anodes
connected together -
300 ma 2 Hours

1 all Cracked up but nearly strips, 12 breaks
2 OK flat no holes - Thick
3 2 Cor Sieve -
4 3 Cor up OK thick
5 OK some sieve
6 OK fairly thick
7 Sieve fairly thick -
8 Semi Sieve fairly thick
9 OK "
10 OK "
11 Sieve "
12 OK "
13 OK "
14 OK 2 cor - thick
15 8/10 stripped "
16 8/10 " Curls
16 OK flat. semi thick
17 OK " Thick
18 OK " "
19 OK " "
20 OK " semi thick
21 OK " "
22 OK " "

Put up the Electrolytic anode with new sol
2 crystals -
1 = Cracked a little, nearly OK
2 OK - 3 Cor small - thick
3 Sieve

2 Hours

31 — ok —
32 ok
33 ok
34 ok

4 Hours 300 Ma

35 ok nearly flat. 2 Cor up 1 big
36 ok " 1 small
37 ok " 2 Cor
38 ok 2 Cor 1 very large blister
39 self peeled, blistered Thick
40 Blistered 2 Cors
41 OK 2 Cor flat
42 OK 2 cor thick
43 ok —
44 ok 2 thick
45 ok 3 Cor up "
46 ok 3 Cors - points -
47 OK —
48 Sieve - points + dirty
49 OK 2 Cors "
50 ok "
51 OK 2 Cor 1 big
52 Edges cracked 3 Cor - bad
53 OK 2 Cors
54 ok 1 Cor
55 OK 1 "
56 ok Sieve 1 Cor
57 OK 4 Cor

537 - 250 cc 2 Grust No. 504 used
12 cc H_2SO_4 used then the
whole was completely neutralized
with $Mg(OH)_2$ 2 Hours 300 Ma

1 = All Cracked up
2 bottom Sieve Edges up slight
3 2 Cor up OK thick
4 — 1 Cor big thick
5 2 " thick not flat
6 Sieve
7 "
8 OK Sieve
9 Sieve
10 OK 2 Edges
11 OK 2 " blister
12 OK —
13 OK
14 OK — thick flat -
15 OK thick " 1 Cor
16 OK 2 big edges - not quite flat
17 OK flat Sieve thick
18 OK
19 OK flat thick
20 OK "
21 OK " fairly thick
22 OK - blister thick
23 Sieve
24 OK — mod thick
25 OK 1 Cor up.
26 OK 2 Cor up - thick
27 OK
28 Sieve
29 OK
30 OK —

24 1/2 stripped - Sieve
25 OK thin -
26 OK mod thin
27 OK thin -
28 OK Thin
29 OK but holes Thin
30 OK thin -

Co

5 holes more using larger beaker

538 - 250 cc NiSoy (2 Grpt)
12 cc H_2SO_4 - using up Electro anodes

1 66° Tohi - only a blush of Ni
2 only a blush
3 blush dark
4 "
5 blush -
~~Now put in 2 cc acetic~~
6 = Very much improved Cant strip yet
8 Next time will put 2 cc acetic in -
9 has acetic - OK but cant strip bright
10 Cant strip -
11 "
12 - 10 grms acetate Nickel in -
12 only strips a few pieces Thin -
13 on verge of stripping V thin
14 Cant strip yet
15 1/2 stripped,
16 8/10 "
17 " "
18 cant strip -
19 " "
20 1/2 "
21 1/2 "
22 9/10 " Cracks Thin
23 9/10 " thin

539 2 Cryst NaOH 250cc Electrolytic
Anode run thru Hydrogen

1 Cracked up - Stripped, thick
2 OK fine, thick
3 OK fairly thick
4 OK perfect, not 1/2 thick of 540 -
5 OK " "
6 OK 1/2 thickness
7 Cant strip Leaves -
8 OK Thin
9 OK "
10 OK "
11 Sieve
12 Semi Sieve V - thin
14 " V thin
15 - OK V "
16 Sieve thin V - Curls

CO

300 ma 2 Hours

540 2 Coupt Nibor - Electrolytic
Anode heated in air to full red

1st Stripped - Cracked up some
2 OK - Very thick - 10 Cos flat
3 OK - 2 cos + ridge at Edge Very thick flat
4 OK 2 cos + front Edge flat - Very thick
5 OK — V Thick
6 OK flat - Very thick thickest off all
7 OK flat Reg-thick —
8 OK " "
9 OK " about "
10 OK — "
11 OK — "
12 OK but holes Thin
13 Sieve
14 OK V thin
15 OK V thin
16 Sieve most thin
17 OK full holes

126 — OK
127 OK 1 cor
128 OK
129 OK
130 OK
130 OK
131 OK
132 OK
131 OK
132 OK
133 OK
134 OK
135 Bad
136 Bad
137 Bad
138 Bright Cant peel
139 Bad
140 Bad
141 OK. pouch
142 OK OK — pinhole
143 OK — No pouch
144 OK 1 Cor | Varnish dried over hot plate. No Nibs probably 8/4 dedut Epoxi & alk
145 OK —
146 OK
147 OK —
148 OK
149 OK
150 OK 2 cor
151 OK

151 ok — good
152 ok "
153 ok "
154 ok "
159 ok "

52D Continued 2 Hours

100 Run OK —
102 OK — Congo papers turns blue not strong
103 OK
104 OK
105 OK

4 Hours 300 MA.

106 — OK nearly flat, few points, 2 Cor
107 OK flat
108 OK "
109 OK " Thick
110 OK " Thick
111 OK " "
112 OK " "
113 OK " " 1 Cor faint
114 OK " " 1 cor "
115 OK
116 OK 3 cor up Top & bottom
117 OK Thick — points — darkish Top
118 Sieve
119 OK
120 — All Crack dark awful —
120 run to unfiltered solution
121 all black & cracked
122 absolutely black all there — brittle —
123 Green no metal
124 all metal but awful cracked
125 " " " " improving
126 OK — 90
128 OK — 90

521 2 Hours

100" Run OK
101 OK
102 OK – Congo paper Lumo blue not strong
103 OK
104 OK
105 Sieve

4 Hours 300 Ma

106 Sieve on music, nearly flat 1 Cor
107 OK – flat.
108 OK "
109 OK " thick
110 Sieve " thick
111 OK "
112 OK "
113 OK "
114 OK "
115 OK "
116 OK "
117 OK "
118 OK "
119 OK – filtered solution
120 OK "
121 OK 2 Corns of standing gel blue at top in small place.
122 Black underneath, Grisewon faces
123 OK 2 Cor repo
124 OK again
125 OK " 1 cor
126 OK
127 OK
128 OK

129 –
130 OK
131 OK
132 OK
133 OK
134 OK
135 Bad –
136 Bad
137 Bad
138 OK
139 dark
140 Bad
141 1/5 bad bal OK
142 all black agido –
143 Top green balance OK.
144 OK 1 Cor } Cooked Varnish over Steam Bath –
145 OK 1 Cor }
146 OK
147 OK
148 OK
149 OK
150 OK 2 Cor
151 OK
152 OK 1 Cor bug
153 OK
154 OK
159 OK –

glucomum

523 — Continued

89	Run	Sieve	
90	"	OK	
91	"	OK	few holes
92	"	OK	
93		Sieve	
94		OK	

4 Hours 300 MA

95	OK	flat small sieve	10 Grams
96	OK	nearly flat	—
97	OK	"	Hmm than 520
98	OK	flat	"
99	OK		"
100	OK	nearly flat	— "
101	OK	flat	
102	OK	nearly flat	"
103	OK		
104	OK		"
105	OK		"
106	OK		
107	Sieve		
108	OK		
109	Sieve	— from filtered solution	
110	OK	—	"
111	OK	—	
112	Sieve		
113	OK	— powder	
114	OK		
115	OK		
116	OK	2 cm	
117	OK	2 cm Top	

Note = Our 6X8 001 metal sheet which is tough was sent over to be run thru Hydrogen weld pots at O'Bat it came out much more brittle than glass — Must be something wrong with their hydrogen
Jany 14 1920 Notified & sent samples to O'Bar

Note — for last 2 months I find we have been using CuO from Silver Lake full of Zinc —

Also with CuO + 8% Dried Sulphate + 6cc 20% NaOH on baking at 1300–7 Alleges — Lots of sulfate Copper dissolved out in water when discs are immersed in Hot water + find it $CuSO_4$ —

Up to This time Jany 12 1920
Regular Commercial Sulphate
of Nickel & Recrystalized Twice
+ using rolled sheet Nickel
anodes, with or without 1 cc
glacial acetic acid, when
the solution of $NiSO_4$ is
saturated + operated at
Room temperatures approx
72 Fahr, water added from
time to time to allow for
evaporation will plate out
good soft nickel sheet
1 inch wide + 2 inches long
such nickel sheet withstanding
more than 15 sharp bends before
cracking. The time being
2 hours at 300 Milamperes
approx 3. Volts,
The Cell Contains 250 cc of
$NiSO_4$ — 100 sheets amounts
to 30 grms of Nickel
The liquor is quite acid even
when no acid (acetic) originally
added. It is unnecessary
to use acetic acid or acetate of
Nickel. But

It is necessary to use $NiOH_2$ Made from double Crystalized $NiSO_4$ in neutralizing Excess of acid although we have not reached that point with 30 grms Metallic Nickel taken from the 250 cc Sol=

Electrolytic Anodes alone or annealed in Hydrogen or brought to red heat in air give only ½ the deposit as Rolled sheet Anodes and increased Surface Even to the Extent of 4 times the rolled surface makes any difference

There is something that is strange in this connection If we have saturated double Crystln $NiSO_4$ 250 cc putting in a rolled anode gives a thick deposit the first time whereas if an Electrolytic is put in the deposit isn't 1/3 as

the thickness altho there is plenty of Ni ions close to the Cathode & also when both rolled & Electro anodes are far apart.

I sometimes think that $NiSO_4$ in the presence of a free SO_3 radical. Combines to a persulfate of Ni & does no harm but if free H_2SO_4 is put in the plating is impossible. The acidity we get may be due to the persulphate & not free H_2SO_4 If this is so it will Explain why in 520 with pure $NiSO_4$ after 100 platings & very acid it is OK & will continue so probably until all the $NiSO_4$ not formed at anode is made persulfate or somehow its a puzzle —

Congo paper shows blue not strong in Electrolyte of 520 after 100 platings so if free H_2SO_4 or persulfate plating is OK

To Ni wire 3/8 immersion in solution of conc NiSO4 — 3 6 8 Hot Acid Rate deposit full of round Cavities due to bubbles clinging at 10 + 12 rate there is large warts but no Cavities because gassing is so strong they grow large + detach at certain point + permits plating This is a new one on me

Heating Electrolyte would of course expand the bubbles they would detach at smaller diameter + thus improve the plating

Again if sol was lowered in Viscosity. the bubbles would be still smaller

test

The jars we are using for leaching the
CuO discs in Hold 450 cc
McChesney say 1 Liter dissolves OK
175 grams of Zinc — ~~The~~
5.7 cc per gram
Above Cell showed dissolve 79 grams

541– Double Cryst. but one Cryst was done in Lead (old) pan

2 Hours

1 – Cracked
2 Improved
3 nearly OK
4 OK —
5 OK

6 OK 3 Hours flat.
7 OK "
8 OK "
9 OK "
10 OK "
11 Sieve
12 ?
13 OK
14 OK
15 lifted at top end 3/4 across holes
16 OK

81 — Dark-Very brittle
82 " " "
83 " " " improving
84 " " " not improving
83 " " "
84 " " "
86 " " Very bad
87
88
89 All bad —
90
94 Bad by improving
95
96 Bad
97
98
99
100
102
103
103
10
108 Bad

Continued

3 Hours 300 Ma

531
62 — OK Clear
63 OK
64 OK Clear
65 OK "
66 OK "
67 OK "
68 OK —
69 OK — from filtered Solution
70 OK 1 hole "
71 OK 2 Cons
72 OK 2 Cons
73 OK
74 OK
75 OK —
76 OK —
77 OK —

1 Hour

78 All brittle Cant strip
think it had feco grms
of Na Sulfite — yes
the Sulphite is in — its not cracked
but just brittle,
79 — all metal but dark — Cant
strip powders up
80 — Improving but powdery & brown

26 — big holes
27 ok
28 ok
29 ok
30 ok
32 — ok
33 ok
34 ok
35 ok
36 ok
37 ok
38 ok
39 ok
40 ok
41 ok
42 ok few holes
43 ok
44
45
46
47 ok
48
49

1 amp 1 Hour

50 — ok.

ok 6 hours. 1 amp. Rough
not Crystalline Nuts
Now add — 12 gms SO_4

542 COPPER
2" Strip ½ amperes 1 Hour

542 - 250cc Reg Comcl Cu SO_4
Sp.gr 1.176 - 1cc 20% H_2SO_4

1 ok turns a little no holes, sticks a little
2 ok " " Dont stick
3 ok " " "
4 ok " " "
5 ok " " "
6 ok no work 1 hole - off hard
6 ok no holes
7 ok "
8 ok "
9 ok "
10 ok
11 ok 1 hole
12 ok no hole
13 ok "
14 ok "
15 ok "
16 ok "
17 ok "
18 ok
19 ok "
20 ok
21 ok
22 ok
24 ok
25 ok

31 — ok
32 ok
33 ok
34 ok
35 ok
36 ok
37 ok
38 ok
39 ok
41 ok
42 ok
43 ok
44 - 5 6 ok
47 ok

1 amp 1/2 Hour

50 ok —

6 Hours ok, Crystals, rough
some nubs, but few & small
now add 16 grms $ZnSO_4$

Put in 12 grms $ZnSO_4$
40 hours — aerofil nubs: some
1 Cryst = Cryst,

543 Copper 1/2 amp 2"
1 Hour
250 cc Cuboy - 2nd Crystal Sp g 1174
1 cc H_2SO_4 - 20%

1 ok. Curled some, few holes Clings some
2 ok " " "
3 Sieve
4 Sieve
5 Sieve
6 ok no warts
6" ok no holes
7 ok "
8 ok 1 hole
9 ok no hole
10 ok "
11 ok "
12 ok "
13 ok "
14 ok "
15 ok "
17 ok
18 ok "
19 ok "
20 Sieve "
21 ok
24 ok "
25 ok "
26 ok "
27 ok "
28
29 ok
30 ok

22 OK
23 OK } soft
24 OK
25 OK
26 OK
27 OK
28 OK
29 OK
30 OK
31 OK
32 OK
33 OK
34 OK
35 OK
36 OK
37 Sieve - OK
38 OK
39 OK
40. Sieve
41 To 47 OK

1 amp 1/2 hour

48 — OK

6 Hours 1 amp
Crystalline - No Nuts
Rough (e) large Crystals
Now add 20 grms $ZnSO_4$
40 hours all nuts
12 hours Best of all thick + fourly Smooth

1 Hour 1/2 amp on 2" Copper
544 = 250 cc 3rd Crystal SG 1.175 1 cc 20% H_2SO_4
1 Hour
1 Cant strip brittle -
2 " " "
3 " " "
4 " " "
Co fa white -
5 Cant strip -
6 Cant strip Brittle.
7 1/10th strip "
8 1/10 "
9 2/10
10 - 3/10 Cu tough but stretches
11 OK but many holes Stringy flexible and soft
Phenomenon Copper strip soft as Gold
without trace of Electroplating -
just like Lead foil —
It dont make best 10 sharp breaks
12 OK less number of holes
13 OK 1 hole
14 OK no hole soft like lead foil. Stringy OK
15 OK " good surface underneath
17 OK " "
18 OK " "
19 OK " Thin
20 OK 1 hole
21 OK
22

Note - Jany 22 1920

The iron pocket grids when put in 1% Solution of H_2SO_4 for 10 minutes & then brushed with fibre (stiff) brush become perfectly bright & satisfactory

This sol will not attack the Nickel Scratch brush should be vigerous to wipe out low rough metal cavities which are only seen in microscope.

Each batch should be made up or taken from a Tank, say 100 grids - 10 min, then fresh solution used grids should rotate in the solution on a holder Holder taken out & carefully rinsed in Water.

Then brush as quick as possible. Rinse again & dry in probably sawdust quickly

Then they will not rust for an indefinite time

Every 2% H_2SO_4 cooled as used without damper –

545 250 $CuSO_4$ Correct 2 grms $ZnSO_4$
then 1 cc 20% H_2SO_4

1 OK ——
2 OK Knocker than 546 & 547 Warty
3 OK no knock

CO

25 — ok
26 — ok
27 ok
28 ok
29 ok
30 to 36 ok

1 amp 1/2 hour

37 — ok.

ok 6 hours 1 amp —
not crystalline, some nubs

Thick after 40 hours 1 amp
+ very few nubs even around edges
has few crystals —

Copper 1/2 amp - 1 hour

546 - 250 Cond $CuSO_4$
- 4 grams $ZnSO_4$ | cc 20%
K_2SO_4

1 ok not a hole.
2 ok " Wavy
3 ok "
4 ok "
5 ok "
6 ok "
7 ok "
8 ok "
9 ok "
10 ok "
11 ok " Comes off easy
12 ok "
13 ok "
14 ok "
15 ok "
16 ok "
17
18 ok "
19 ok "
20 ok "
21 ok "
22 ok "
23 ok "
24 ok "

28 — ok
29 ok
30 ok
31 ok
32 ok
33 ok
34 ok thin
35 ok
36 ok
37 ok
38 ok
39 ok
40 ok holes
to 46

1 amp 1/2 hours

47 — ok

6 hours 1 amp —
Shade Crystals considerable
Number fine Nubs
of 542-3-4-6 & 7
547 best no crystals or warts
546 next best.

40 hours 1 amp some bases at
Edge but face nearly
smooth — good

Copper 1/2 amp 1 hour

547 250 cc Comal CuSO4
8 grams ZnSO4 — 1 cc 20% H2SO4

1 = ok - 1 hole
2 ok no holes warty
3 ok "
4 ok "
5 ok "
6 ok "
7 ok 1 hole
8 ok no holes
9 ok "
10 ok "
11 ok "
12 ok "
13 ok "
14 ok "
15 ok holes
16 ok no holes
17 ok "
18 ok 2 thin
19 ok ~~ok~~
20 Sieve
21 ok
22 ok
23 ok
24 ok
25 ok
26 ok
27 ok

549 240CC 2nd Crystal Using
Electrolytic anode & OH heated in
pure hydrogen & OK by L OH -
4 Hours 300 MG

1 – Edges cracked & partially peeled
2 OK 3 holes thin –
3 OK thin –
4 OK thin
5 OK "
6 OK part chick "

CD

550 238 cc $NiSO_4$
300 ma · 1 Hour

1 — all cracked
2 OK 4 Corr 15 bends
3 OK ——— 12 bends

$NiSO_4$ made, Concd $NiSO_4$ in City water added about 2.0 grms Copperas — Oxidized with BaO_2 precipitd about 5% of the Nickel — all of the Iron with BaO_2 (ordinary $Ba(OH)_2$ Settled & poured thru filter. —

551 - 3rd Crystln Cutboy - Nickel anode
300 ma, 1 hour

1 = Count strips brittle,
2 Count " "
3 Count " "
4 " " "

552 3rd Crystal Mi 504 —
Copper Anode - 4 Hours 1/2 amp

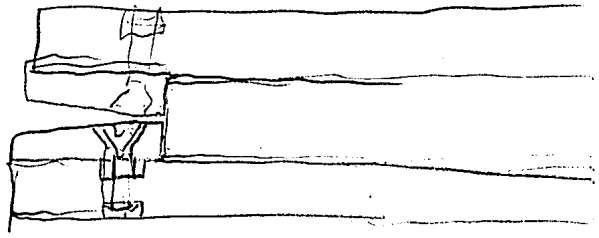
1 Horrible mix cracked Ni over
thin mush Copper — Cu 1" at bottom
2 all Copper Spongy

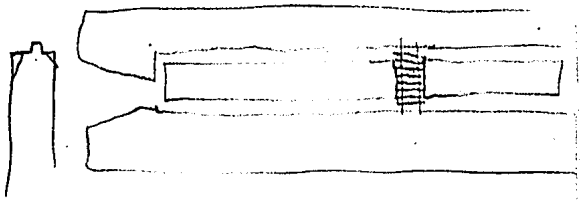
CD

Notebook Series -- Notebooks by Edison
Notebook, N-20-00-00.1

This undated notebook was used by Edison, possibly in 1919. It contains four numbered drawings showing different spring mechanisms connecting two plates. The drawings probably pertain to molding or pressing equipment for disc records. One loose drawing by Edison, inserted into the book, may or may not be related. The pages are unnumbered. Only 3 pages have been used.

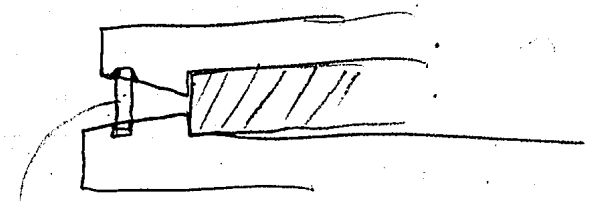
Acme Co.,
MFG. STATIONERS,
95 JOHN ST.
AND
19 PLATT ST.
NEW YORK.





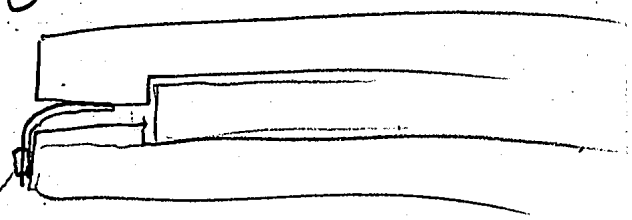
Drawing No 1

No 2



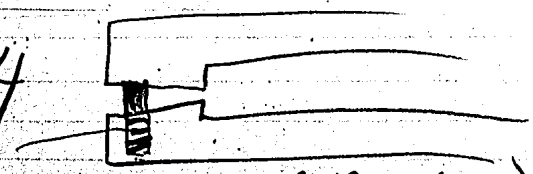
3 of Copper or type metal
hole in each - wire 50/1000.

No 3



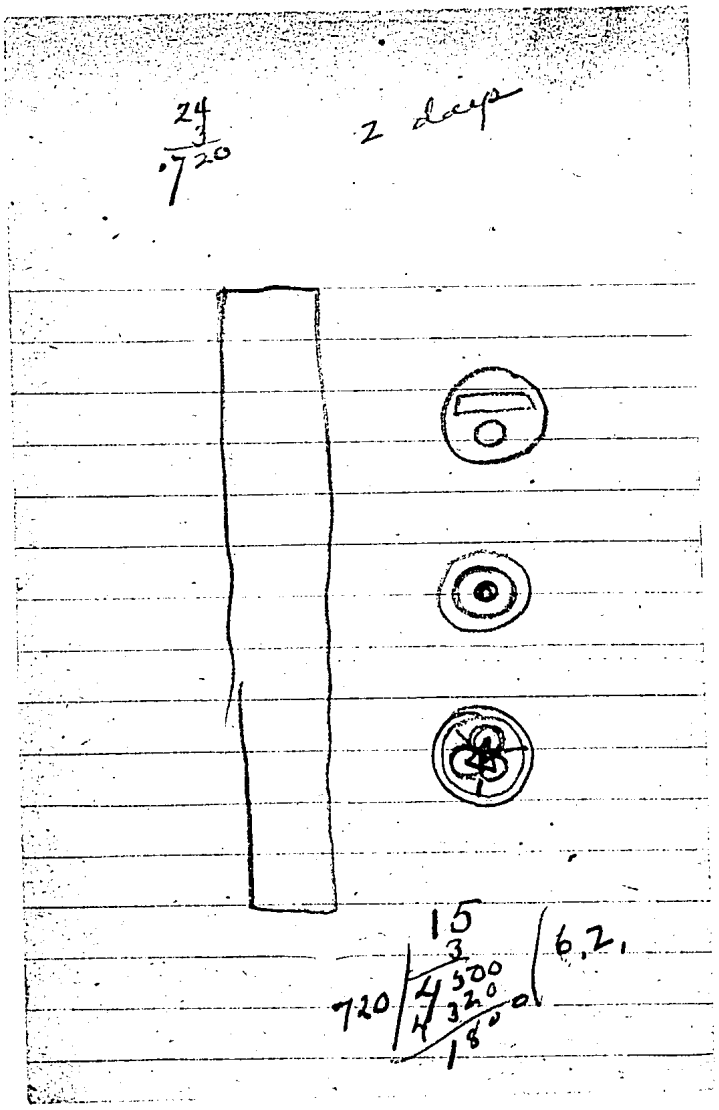
3 of them spring very stiff
hold up 50 to 100 lbs

4



pin & spring 3 of them hold 50 @ 100 lbs

[ITEMS(S) FOUND IN BOOK]



Notebook Series -- Notebooks by Edison
Notebook, N-20-01-27

This notebook is a continuation of N-19-12-06. It was used by Edison in January 1920 for notes pertaining to ongoing electroplating experiments performed with various numbered electrolytic and chemical preparations. In many cases, Edison described the condition of the plating on successive runs, sometimes in various plating baths. The front cover is labeled "No 8 General Book Jany 23 1920." The pages are unnumbered. Approximately 20 pages have been used.

Jany 27 1920

8/4 Selenium Acid sticks much better to Nickel than Copper No strip 001 blackened by 8/4 Can be bent at sharpest right angle with Cracking But if an too dark it rubs off.

Can go to full red

553 Daughters

1 all cracked up

554 Doughboy

1, 2 & 3 all cracked up

4 = Contains some Nickel
Sulfite — This is metal
Curled up bad & very brittle

5 = Improved but powdery & dark

6 ditto.

7 ditto improving — brittle

8 "

9 improving but powders up

11 Very bad

12 "

13 Bad, red, powdery, not cracked

14 Bad.

15 Very bad

16 Bad.

17

18 All blue & Very bad

19

20

24 — ok
25 ok
26 ok 2 cor
27 all
28 ok thick.
29 Cracked
30 "
31 "
32 "
33 "

1 hour 300 MA

555 3rd Cryoglin [illegible]
will add 1 Milg NaCl after
slips ok
1 all cracked up
2 fair
3 ok
4 ok
5 ok 2 cor very slight
6 ok 1 cor
7 ok — thin.
8 ok —
9 ok
10 ok "
11 ok
We now add Salt
12 ok — salt added 1 Milg
13 ok
14 ok points
15 ok "
16 ok
17 ok
18 ok
19 Sieve
Added 5 [illegible] grams NaCl
21 — ok points
22 Sieve
23 ok but 1/2 Slip Curled away

25 = OK 1 Cor
26 OK good amount efficiency
27 OK
28 OK 1 Cor
29 OK 1 Cor
30 OK 1 Cor
31 OK 2 Cor thick
32 Cracked bad
33 " "
34 " "
35 " Very bad
36 " " self sloughing

556 – Same as 555
but after OK well wet filter paper 1½ hours then removed
1 – all cracked up
2 – fair
3 – OK
4 OK
5 OK 1 cor amount
6 OK 1 cor "
7 OK thin
8 OK
9 OK
10 OK "
11 OK

We now add filter paper 1½ hour
12 OK 3 holes
13 OK
14 OK – Very clean & bright,
15 OK " thin
16 OK
18
19 OK
20
21 OK

Added 3 grms NaCl
23 OK
24 OK

Dan Yan has succeeded in taking solid KOH from Niagara Falls Containing 2.20% KCl – with one crystalization he got it down to 0.5% salts by 2nd Crystn Cancaget it down to 0.20% KCl, will figure out a plant.

558 = 125 cc of 553 taken &
125 cc 554

Some H_2S gas passed to take up the free Oxygen, some filter paper added & then rolled up & filtered

1 = All cracked up -
2 Bright but Curled up
3 ok — bright, some holes
4 ok " " Then
5 ok "
6 ok "
7 ok "
8 ok "
9 ok —
10 Sieves
11 Sieves
12 ok — , blisters!

CO

Copper

559 $CuSO_4$ 2nd Crystn. 250 cc
20 gms $ZnSO_4$

1 = smooth
3 fairly smooth; not thick
4 smooth. thin - 3 cc H_2O/H_2SO_4

Copper

560 250cc sat $CuSO_4$
25 grms $ZnSO_4$

1 Smooth

3 Nearly smooth / Much better than 559

4 Very smooth / Much better than 559 - 3cc H_2SO_4 used

This is good!

Copper

561 250 cc 2nd Crystn $CuSO_4$
35 grms. $ZnSO_4$

1 smooth

3 Smooth + better than 559 or 560
Thickest of all

4 Very warty. 3cc 20% H_2SO_4

562 - 250 cc 2nd Crystln Cu SO4
50 grms Zn SO4

1 Smooth
3 smooth. thinner than 561

4 Very Warty - worst.
3 cc H_2SO_4 acid.

559 to 562 — Only 560 is thick & good.

Copper

563 - 250 cc 2nd Crystn $CuSO_4$
75 grms - $ZnSO_4$ -

1 Smooth
3 Considerable Warts,
+ much thinner than others
nearly like 559

566 - 250 cc. $CuSO_4$ 3rd Crystin
no acid

1 Hour 500 ma —

1 = OK soft fine cryst
2 = OK Stiff, stripes harder

3 OK — 2 Hours
4 OK fine nearly Edge -
5 OK " worse

7 OK 4 Hours
8 OK - Considerable Nubs at Edge

See 570

567 250cc Cubay. 4th Crystal
no acid

1 Hour 500 ma

1 — ok soft
2 = ok stiffer stripe harder

3 ok — 2 Hours
4 ok fine wavy Edge less than 566
5 ok. "

4 hours
7 ok
8 ok
see 570

568 200 cc $CuSO_4$ 5 lb Graphite
no acid

1 Hour 500 ma

1 — ok soft

2 = ok harder — chips harder

3 ok from wearing edge 2 hours

4 "

5 " more, less than 67

7 ok 4 hours

8 ok

see 570

569 - 250 cc CuSO4 6th Crystals
no acid.

1 Hour 500 ma.

1 ok soft

2 ok harder, strips harder

2 Hour

3 ok

4 Scarcely any warty Edges

5 "

4 Hours

7 ok

8 ok

to

13 — see 5 yds

570 250 cc $CuSO_4$ 7th Crystals
no acid

1 Hour 500 ma –

1 – ok soft – 566 to 570 all same size Crys

2 ok harder – strips harder, Crystals

3 ok ~ 2 Hours –
of 66 To 70 There is best at edges
scarcely a sign of warts, considerable
on 566 – Crystals of Cu about the
same ~ to 1/8 of width of groove

4 OK no warty Edges small Crystals
5 ok " " almost

All of this series very soft now
Come off harder than Nickel. 570 ;
Exceedingly hard to start Tearing.
yet 566 Easy to Tear –

4 Hour

7 Edge much less nubs than 566 –
8 " Very much less than 566

It is remarkable how much
570 Resists tear compared
to 566

9 = 566 most nubs 570 least

570 Continued

10th O/K 4 hours 1/2 amp
all about same as 2 hours
rubs at Edges about same as 2 hours
+ about same as 566 as 570

11 = 1 hour 1 amp much more
rubs at Edges -

12 2 amp 1 hour very bad
rubs all Edges, thin + generally
Not good

4 Hours at 1/2 amp is limit
which is present disc rate

13 - Run 1/2 amp 15 hours
566 most rubs at Edge but
567 - is about as good as 570
566 thinnest - 570 is only one
Can see Music on back
fine crystals.

Notebook Series -- Notebooks by Edison
Notebook, N-20-06-02.2

This notebook was used by Edison on June 2, 1920. It contains a single entry describing the procedure for cleaning disc record molds "as man was taught." The process involved two dips into a bath of "8/4," a solution of selenious acid. Inserted into the book is a note from Edison with instructions for Frederick P. Ott regarding the cleaning procedure. The pages are unnumbered. Only 4 pages have been used.

June. 2 1920

As man was Taught

Cleaning bath, changed when black
Amperes 40 to 62 used 1½ minutes
when running continously change Every 12 hrs
plate put in = Current off = when
in, start rotating by pulling on
belt — Close switch to put
Current on — Never put in bath
when Current is on.

Now done — plate put in with Current on

Taught — Open switch to stop
Current — & remove plate quickly —

2 Wash well with hydrant water
in Machine made for the purpose
& finally rinse with distilled
water at angle while rotated
Use Lab wash bottle. 1 minute

3. Put in 8/4 — of such a strength
that it reds as per standard Copper
Slip in 1 minute Then keep
disc in 1 minute till it gets same color
as test slip —

as it weakens the more discs are coated, The solution must be strengthened from time to time by adding a little strong solution + try test strip, at same time watch the disc + see it does not go a deeper color than full deep red, if after 1 minute it is not as red as test Copper, Keep it in longer than 1 min, —

If Nickel is used use copper test strip. so A disc of Copper would be red in 1 min —
As Nickel is difficult to tell from the color the only safe way is to use test strips + keep bath constant strength should be corrected every hour when running full.

When disc is removed from 8/4 bath wash in hydrant Machine + rinse with distilled Water — This Operation requires 1 minute —

Put disc on whirling machine + whirl till dry - 1 1/4 to 2 minutes required according to weather

When dry put in holder and varnish with Kopper Varnish to within 1/4 inch of Edge - After — hours revarnish + dry - — hours it is then ready -

Redip

When a disc is to be redipped put in cleaning bath 20 seconds remove - wash hydrant water both sides, rinse both sides with distilled water, Remove Copper Nubs -
Then put in 8/4 Solution 10 seconds,

Remove + wash — Dry + put on one coat of Varnish - + dry

Speed of 8/4 baths should be very high but not so high as to spatter

The holder arms should be kept
Extra high so mould not injured
in lifting out —

The Washer originally used
should always be used

[ITEMS(S) FOUND IN BOOK]

Fred Ott –

go over and time the
operations in 8/4 treatment
Dept – _____ 112 #1
20, 28.

Cleaning Time – 1½ min unpacked
washing " 1 min
~~18/4~~ Solution " 1 minute
Wash 1 min
Dry – 1¼
Paint 1 coat. 40 seconds

Redip in 8/4 – 30 seconds
Wash – 1 min
dry 1¼ min
Paint – ~~they paint at all.~~ every time they redip

find out if in redipping the clean
~~before redipping~~ – ~~use~~ how long
just the same as new mold

[ITEMS(S) FOUND IN BOOK]

Second Master go to bath wet
working female go to bathe wet

Master molds dried
" female "
amperes on #1 Cleaning bath 28 amp
" " #2 " / " 20 amps
when the man puts in mold the
circuit closed and takes
it out the same way with it
being the current ought to be off
in both cases
the anodes in #2 bath are only
2" in the solution in #1 they
are eaten away Thin

Notebook Series -- Notebooks by Edison
Notebook, N-20-12-04

This notebook was used by Edison in December 1920 for notes relating primarily to the composition of the wax masters used in the manufacture of disc records. Included are entries pertaining to various wax preparations. At the end of the book are two drawings of disc record labels. The pages are unnumbered. Only 18 pages have been used.

Dec 4 1920

Master Wax - Not affected by acid of bath -

Paraffine + Palmitate Alumina too soft, Not free of dish

Ditto Ceresin Not free of dish

With Candellana it gets softer the more palmitate of Alumina you put in with the most it cuts hard + slightly breaks but has a viscous feel - Dont come free of dish

Reg wax. get 2 or 3 doses of palmitate of in -

Candallana itself seems to be hard enough but its more brittle than Reg Wax - I will try a softener to stop brittleness

Our Reg wax will take more Stearic + Cut OK This should make more acid proof

Our Reg wax will take Considerable Palmitate Alumen + Cut OK This should make more acid proof.

Bayberry wax is dry not slightest viscosity not brittle it might work alone + give a very sensitive wax. altho it is not as hard as Reg wax or Candellena but Cuts deep no chipping, polished surface,

12 Hours not attacked in Cu Sol baths
Its Cold this in Lab + No 4
dont Cut deep enough wants
more Ceresin - if Cold -

Candellena Some Ceresin -
Could not track so deep, but chunk
it roll's more sensitive + less hard
to Cut 2nd dose —
The 4th Dose cuts deeper without
Chipping This more resembles
Regular — It is still very hard
PROMISING = Work up by
weighing — Try perfume, Bunny

Candellena —
1 Dose Ceresin
2 " "
3 " "
4 " "

shrunk very little - nearly flat Top — runs up on sides

shrunk a little when Cold Touch Edge with Knife Cracks away in part

Cant Cut as deep as reg + Cut not as polished - fair —

Phenomenon

Bayberry wax has an enormous effect on Candellera
1st Dose makes a tough, deep cutting bending wax
far more effect than Cerusin
found all cracked in dish —
Some chemical change probably
Acts like Alcanic on Rosin

Candellera

1 Dose Bayberry
2 " "
3 " "
4 " "

Both bottle pretty flat
Rumour on cider —

Bayberry

Both bottle —

1 = Candellera "
2 "
3 "
4 "
NG

Poor — 1st 3 white wrinkled up + NG — 4 white + cuts like soap NG

Inate this morning, rather cold in Laboratory + Heat 104 Cuts good — not viscous or flex
The 104 if kept cold might be very sensitive to Razor knife — Could have a Water jacketed Razor holder —
Cant cut as deep as Rag

No 1 – Cracked across – free of dusk Cuts powdery no depth

No 2 not cracked free, Cuts powdery

No 3 not cracked free, Cuts powdery but not so bad

No 4 – about same –

This shows that considerable Koppers Can be used in Candellero without changing its hardness or cheapening of Cheaper

Note →

Bayberry
Palmitate Al
" Not made
"
4 "

Candelleria

1 Dose Koppers Resin
Cracked across – Cumerone

2 " "

3 " " Dissolved good

4 " " Works fairly well in Making

Think Low Melting point Wax Compositions will give us trouble in Summer
This is low M.P. Combination –

All very brittle & powdery NG

Koppers Cumerone Resin

1 Dose Candelleria

2 " "

3 " "

Spongy NG.

4 " This one " may be OK
flat –

Works Gas lots gas & frothy – sluggish – probably wants more cooking – May be better in Koppers

not allowed by Electrolysis

Candelleria + 150 grams
3. Dose Parafin 15 gms
4 " " 20
5 " " 25
6 " " 30

Candelleria 150 grms
3 Dose Cereain
4 "
5 "
6 "

I note, that Reg wax
1.25 grms that addition
of — 5 grms of stearic
makes it very much less
attacked by acid of bath

The same thing occurs
with greater range
when palmitate aluminum
is added —

If too much stearic
added it shows shrinkage
etc — wavy

Note 4 grms Not
so good —

Note →

? Affected by Electrolyte

150 grms Req Wax
& 2 grms Vaseline 15
hours in Req plating
Solution — just barely
Whitened —
Cut is OK — & hard

1509 Candellerin

1 grm Castor Oil — no change

2 " "

4 PROMISING Cuts not so deep as Req wax but good

8 Too Soapy, tough —

Think 4½ @ 5 grms Req
good

150 Candellerria

Between 2 & 4 grms Castor Oil is OK if stand acid test

8 grms dull cut

Effected by Electrolyte.

150 gr Reg Wax 8 to 12 grms Castor it will stand, see if attacked acid

---

Effected by Electrolyte

150 Reg Wax

4 grms Balsam Copaiba ok. 8 soapy cut. see if stands acid

Edison
Palestrina
Fox Trot - Sodoro
Band —
126 000
80591

PALESTRINA
Fox-Trot
EDISON
Sodoro Band
126000

Master Female

GIN NIG

male

GIN NIG female

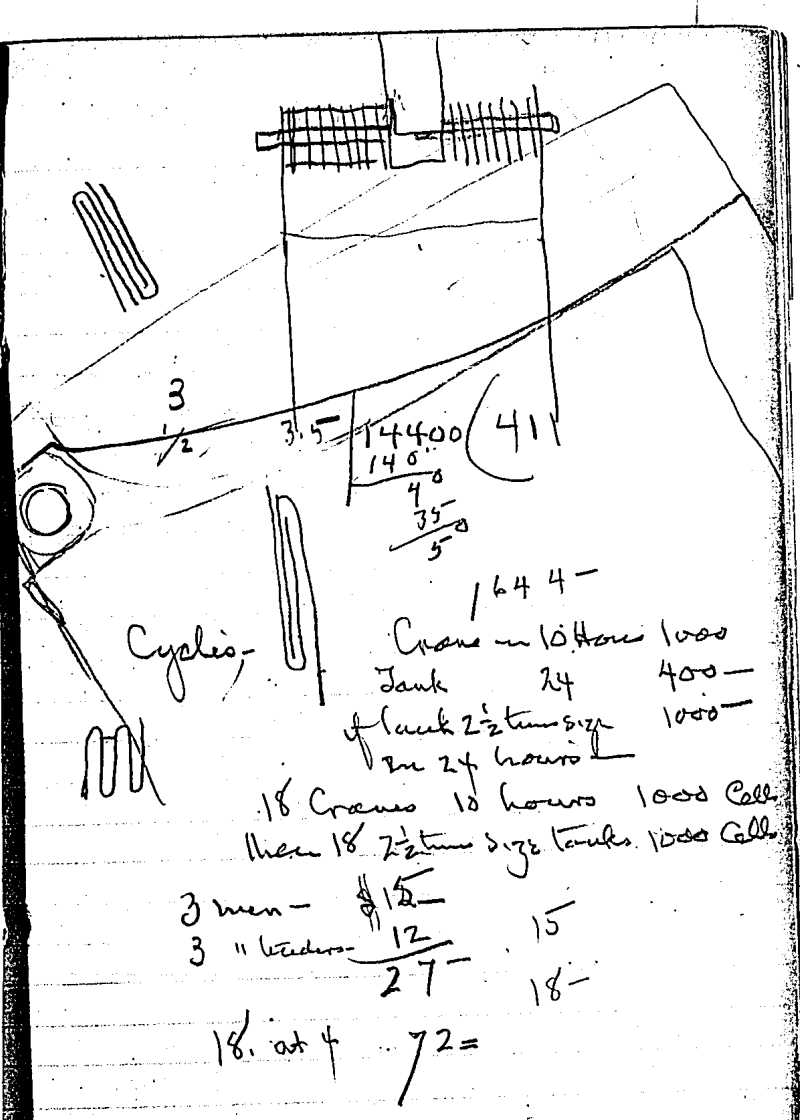
Record

Notebook Series -- Notebooks by Edison
Notebook, N-20-00-00.2

This undated notebook was used by Edison, possibly during 1920, for rough notes and calculations pertaining primarily to the electrolytic manufacture of nickel flake for use in the positive electrode tubes of the Edison storage battery. Included are references to the cranes, tanks, and labor employed, as well as notations regarding current ratings, time allowed, and costs incurred or saved. Inserted into the book are circular advertisements and letters [not selected], addressed to Mina Miller Edison and dated 1918. The back flyleaf has been torn from the book, apparently after being annotated by Edison. The pages are unnumbered. Only 20 pages have been used.

Emma Leiter Parmelee.
270 Berkeley Ave,
Orange. N.J.

69593
Acme Co.,
MFG STATIONERS,
95 JOHN ST.
AND
19 PLATT ST.
NEW YORK.



3

750050

37 5 01 2 0

5 0 0 0

5 0 0

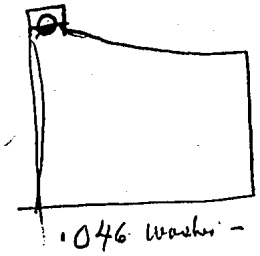
3 0 0

3 5 7

3 61

150/1000 per pair

800/1000 Constant



10 pair Constant 1500 800 2.300

15 pair 3050

20 3.800

150 15 750 500 250 800 1050

.046 Washer

20) 3000 (150 20 100 3000

010 20 6

3 inches

36 20 72

7440 820 2.260

150/1000 Coupler

500 250 800 8.30

250 1200 5000 250 3000

300 grams

10 6 10

26/1000

53 53 106/1000

Plate .010
paper .008
Wash. .030
lost space .005
.053

46

.010	.020		.020

.010 | .010 | 3 | 3 | .010

26

106 70 250 500 80 2.950

2.95

135
4
540

145
4
580

010
4

1

40
30
120
600
300
150
75
37.5

010
020
040
080
160
320

145
5
725

1

3/37 inches 333

3.5 / 123 / 105 / 185 / 175 / 50 — 3.5 1"

203
10 balls
213
50
263
50 Labor
313
Labor & q

3½ lbs

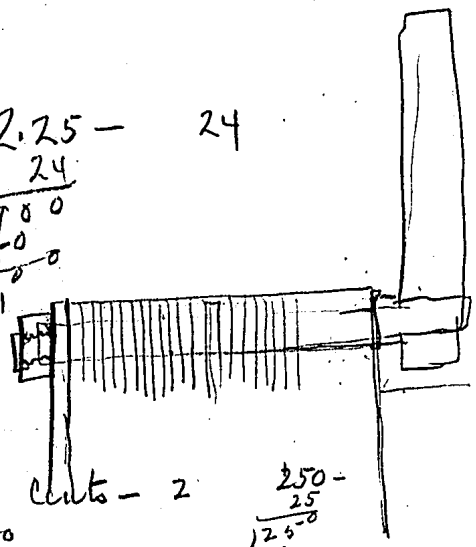
4 lbs steel — 10c
3 lbs " 7 — 15

4 oz washers
paper

1 lb 3/4 lb Ni
$ lb Iron
160 — Cotton
Extra gear

40
21
2
5
45
50c
20
20
203

2.25 — 24
24
900
450
54



54 Cuts — 2
300
1620

250
25
125
500
625

4 V. 1 amp
$162 per year

40 washers
046 thick
4.50 / 6250 / 4500 / 1750 — 17

16200

12 lbs
4 Cfb —
3

250
50
1250

250 HP
12
500
2500
30

250
160
1500
1500
25000
40

44-(

60.

175
60
1050

44
220
88
88
96

44
250
220
88
1101

5 am

240-

44
240 — to 2
176
88
1056

175
140
35

1

Lead 25.8", req

154.8
2
309.6

309 — inches bottom edge -

- 60 | 309 (5
300
10 -

39
45
195
46
65 -

64 | 1655 (25.8 outside —
128
370
320
50

516
6
309.6

7 | 1800

560
2
1120
56
1176
850
2026

600 —
250
3000
1200
150 -

150
200
30
30 amp

13

125
13
375
125
1625
806
2431

62
13
186
62
806

84
300
2) 2550
1275

250) 850 (.340
750
1000

90
150
45
40
90
135

3100) 8500 (2.7
6200
2300
3100

250

12
2600
72
24
2.3) 2.74

12450) 35000 (2.8
25000
9925
9975

1. - floating on bolt mix
2 - clamp for strips
3 - outside plates lugs at bottom
4 =

Ni 1. ampere 1 inch for 35 seconds
.340 " 1 " " 25 second

Ni 35000 Ma seconds SBat,
Cu 8500 " "

Old speed 210 seconds One Rev -
180 sec Cu
30 sec Ni -

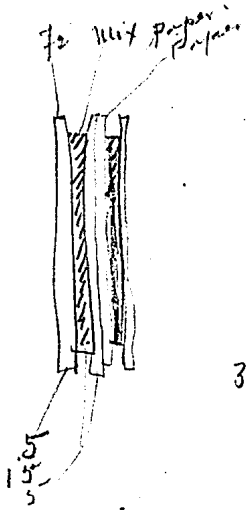
Now 260 Cu - 12 ma 3120 ma seconds
90 Ni - 25500 -

Copper should - be 6375 amisec

8500) 35000 (4.1.
34000
1000

~~Copper now 3120 Cant~~
increased -
~~Nickel should~~

90
150
45
40
90
135



35

35) 275 (7
245
30.0

1.5
7
10.5

$\frac{1}{10}$. 100/1000 - X 125/1000

100-

$2\frac{1}{2}$ times less

If Cu is now 3120 ~~Ma~~ sec
nickel 4 to 1 should be 12480 or put to 100
ma ~~100~~

.5
.5
1.5

Copper is now 12 ma - 260 sec - 3120
Ni " " 300 " 85 12,750
4 to 1 which is ok now to get
35000 ma seconds on Ni -
Either Current must be 2.7 times more
or kept the same & speed diminished
2.7 times.

5. 330 sec
27
2310
6600 (14.8
60) 891
60
2910
2400
510

300 Mcu 11

300

3300 — Mcu watt —

1200

2100

300.

60%

287

280

Cu 300

280

140

1200

280

3.5398

25

175

70

87.5

30

57 —

87.5

4.35

261

25

1.20

50

25

30

87

35

261

261

54

S

1000

23 8000

1384

4000

92

184 —

90. ~~000~~ day saved

19

45

95

76

85.5

450

180

85

103

184 Current.

103 " wages

40 Repairs

327

140

187.

190

50

140

327

4500 | 163500 | 3

35000

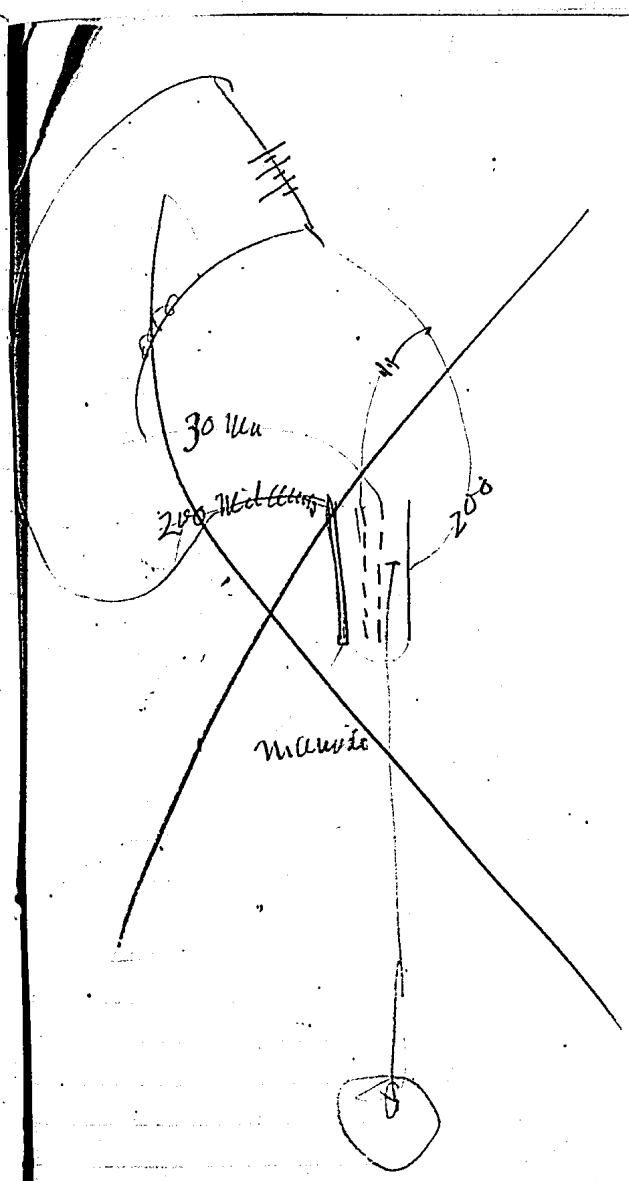
285000

19 Crane 5	95
4 Shippers	20
20 Repair	100
2 Filler press	10
2 Wash	10
12 Separator	60
4 Dry	20
4 Cut	20
6 Fix Solutions	30
10 Gen'l Repairs	50
Current	184
Chemicals	30
Miscellaneous	100
	729

40 000 / 23 / 7000 / 8000 / 5 / 9200 / 1840

729 / 55 / 3645 / 3645 / 4009 / 44

4500 / 400 / 1800


30 Mu
200
200

3 6 9 12th 15 18
1 2 3 4 — 1st Female — 4

15 18 21 4 — 10
8 — 1 4

4 — 1st Females 12th day
15 — 4
18 4

1 bath 12 days —
Wait 12 days get 4 — 1st Females 1 bath

Put all in bath on 15th get 4 — Males 4 baths
4 baths — 6 days — 18 8 "

21st — 8 baths 6 days — 8 females
24 16 —

27 16 — 3 day — 16 — week
30 — 16 3 32
3 16 3 — 64
16 3
16 — baths 12 days

23 baths 12 days. 64 wking Mould

46 — 6
92 — 3 — 64 wking
184 — 3 — 128
368 — 3 — 256
736 — 3 — 512
1000 — 333 Mould daily

3 6 9 12 15 18 21

1	2	3	4	5	6
	1	2	3-6	4	10 moulds
		710	20	40	

1 — 12 — 12 — 1 day
4 6
8 6
16 — 12 — 23 baths 12 days

16 baths 12 days
4 12
2 12
1 12

1

4 Lathes

1 - tath 1 —
2 "

1					
2	1				
3	2	1			
4	4	2	1		
	8	4	2	1	
		8	4	2	
			8	4	
			16	8	
			10	16	

3	1					
6	2	1				
9	3	2	1			
12	4	4	2	1		
15		8	4	2		
18			8	4		
21			16	8		
				16		

NOTEBOOK SERIES
NOTEBOOKS BY EDISON
AND OTHER EXPERIMENTERS

Notebook Series -- Notebooks by Edison and Other Experimenters

The six groups of notebooks (sixty-nine books) in this subseries cover the period 1914-1924. The first three groups pertain to phonograph records. The notebooks in Group 1 are numbered 1-26 and relate to efforts to improve the quality of Edison disc records. The eleven notebooks in Group 2 describe a variety of experiments to improve the disc record manufacturing process, particularly the plating baths, and to solve problems with current electroplating. Group 3, consisting of twenty notebooks, is arranged into two subgroups. Seven books by Absalom M. Kennedy contain daily records of experimental work with phonograph recorders and reproducers. The experiments in the remaining books involve the use of various types of recorders and horns—as well as variations in the positions of horns, recording machines, instruments, and voices—in order to determine the optimum volume and quality of sound.

The three notebooks in Group 4 were used during World War I for experimental work for the U.S. Navy and other war-related research conducted under the auspices of Edison. Group 5 contains data on battery cell tests performed at Edison's request, while Group 6 consists of two books of miscellaneous experiments. Among the Edison employees whose work is represented in these books are Walter N. Archer, E. Rowland Dawson, William Deans, William W. Dinwiddie, William A. Hayes, Archiebald D. Hoffman, Absalom M. Kennedy, Sherwood T. (Sam) Moore, Harold H. Smith, George J. Werner, and Henry G. Wolfe.

The fifty-six notebooks with evidence of Edison's involvement or oversight have been selected. The thirteen unselected books contain no substantial comments by Edison or references to his work. The books are arranged in the following order:

Group 1: Disc Record Books, 1915-1918 (26 books, all selected)
Group 2: Disc Plating Experiments, 1920-1921 (11 books, 10 selected)
Group 3: Recorder and Recording Experiments, 1914-1924 (20 books, 15 selected)
Group 4: Navy and Wartime Research Experiments, 1917-1918 (3 books, all selected)
Group 5: Battery Experiments, 1914-1919 (7 books, 1 selected)
Group 6: Miscellaneous Experiments, ca. 1916, 1918 (2 books, 1 selected)

Notebook Series -- Notebooks by Edison and Other Experimenters
Group 1: Disc Record Books, Nos. 1-26 (1915-1918)

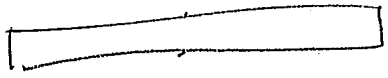
This group of twenty-six notebooks was used during the period December 1915-September 1918. All of the entries in the first fourteen books are by Edison. The next eleven books also contain notes by Edison, along with increasing numbers of entries by William W. Dinwiddie, Archie D. Hoffman, and others. Book 26 contains no entries or notations by Edison. The notes consist primarily of a sequence of numbered experiments relating to efforts to improve the quality of Edison disc records. The experiments were focused primarily on the composition and construction of disc record blanks, as well as the coating of the varnish into which the music was pressed or printed. Other employees who assisted in the work include G. H. Baldwin, Charles G. Kircher, Sherwood T. (Sam) Moore, and Frederick P. Ott. All of the books have been selected.

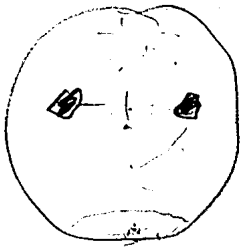
Book #	N-Number	Labels and Inscriptions on Front Cover
1	15-12-29	"1916 #1 Disc Expmts 57E"
2	16-01-18	"1916 #2 Disc Expmts 1-18-16"
3	16-01-20	"1916 #3 58E Disc Expmts"
4	16-01-28	"1916 #4"
5	16-00-00.3	"Disc 5"
6	12-00-00.5	"Disc 6"
7	16-02-25	"Disc 7"
8	16-02-22.2	"Disc 8"; "Mechanical"
9	16-03-01	"Disc 9"
10	16-03-07	"10"
11	16-04-27	"No 11"
12	16-05-04.2	"No 12"
13	16-05-10	"No 13"
14	16-05-17	"14"
15	16-05-15.2	"No 15"
16	16-06-14	"16"
17	16-07-21	"17"
18	16-08-12	"18"
19	16-09-07	"19"
20	16-11-30	"Disc Records"; "20"
21	17-04-11	"Disc Records"; "21"
22	17-06-15	"Disc Record"; "22"
23	17-07-15	"Disc Record"; "23"
24	17-07-31	"24"
25	17-08-06.2	"25"
26	18-03-11	"26"

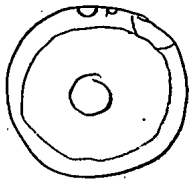
Notebook Series -- Notebooks by Edison and Other Experimenters
Disc Record Book No. 1
Notebook, N-15-12-29

This notebook was used by Edison during the period December 1915-January 1916 for notes on experiments to improve the composition of disc record blanks and the varnish surfaces applied during the transfer process. The entries at the beginning of the book pertain to experimental record blanks numbered from 1279 to 1289. Subsequent entries describe a sequence of experiments numbered from 1E to 57E. Included are notes on results obtained from varying the ingredients or their proportions, as well as varying the dipping time for varnish and varying the pressure and heat applied in forming and coating blanks. The summary of results usually provides a tally of acceptable and unacceptable record surfaces obtained. Also included are lists of solvents to add to varnish and other materials. Some of Edison's notes are in the form of instructions to Archie D. Hoffman, Sherwood T. (Sam) Moore, or other employees. Inserted into the book is a form entitled "Experimental. Powder Blank Transfer Inspection," along with another form entitled "Final Record Test." Both forms have been filled in by an unidentified experimenter and date from January 1916. The front cover is labeled "1916 #1 Disc Expmts 57E." The pages are unnumbered. Approximately 170 pages have been used.

66.69
Acme Co.,
MFG. STATIONERS,
96 JOHN ST.
AND
19 PLATT ST.
NEW YORK.







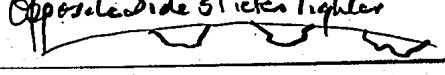
90% of Cracks are at Edge like this — its due to dipping

Must put on Centers & when its taken out of bath must be rotated till dry or so long as it will flow —

This kind of Crack

Chips out with Knife thus

Opposite side of Picture lighter



Ragged pull out.

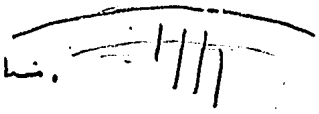
It looks as if one side of the blank sticks light & the other loose — The question is is the bottom or the top side in moulding blank that is bad —

Out of 55 Baldwin Cracked blanks
37 was

Round like this

8 like this

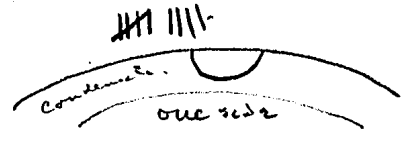
8 like this.

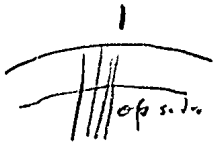


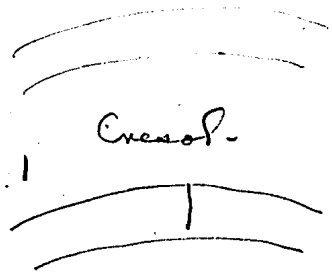
Of the two I tested
both were old Condensite blanks.

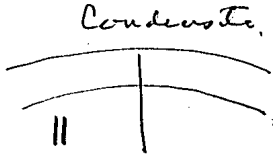
Evidently old Condensite blank after 2 or 3 years shows up cracks. The face blank shows up soonest.

Old blank Condensite — Returned Records



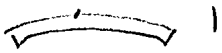


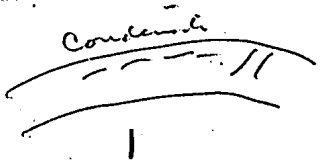




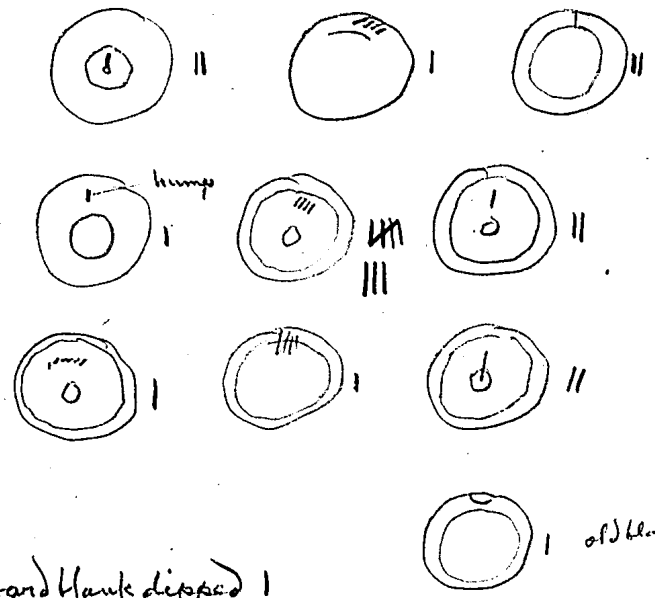
Both sides cracked

Cracked on round side





Lac Blank records —



Hard Hank dipped I
" III

12/29/15

Expt No of blank 1279

5 of wood 1 fine ordinary graphite. 1 shellac & 30% Condensite blank powder

75% OK

24 made 6 discards all Cracked.

poor edges, but no worse than Reg — Breakout.

Phenomenon
1280 Expt

Notice that the transfer sticks better to blank than old Condensate & in fact better than any one ever had

12/29/15

Expt 1280 Blank

5 lbs good ½ lump black
1 Shellac 30% of blank powder -

72.75% of

All discards - cracked

Edges break out like Reg

Blank slightly blacker

1 RO3 soft	T.B. track	RO3 – nearly soft
2 RO5 loud		RO1 soft
3 RO4 soft		RO3 fairly soft
4 RO3 loud		RO1 – Loud
5 RO6 soft		RO5 fair
6 RO2 loud		RO2 nearly –
7 RO3 soft		RO1 soft
8 RO4 "		RO5 fair
9 RO3 "		RO4 "

RO	Jum IIII II
1 III	
2 II	good II
3 IIII I	
4 III	fair III
5 III	
6 I	Ruf IIII
7	

Too much Naphthalene

Should try 24

with $\frac{1}{12}$th of

another 24 with

$\frac{1}{16}$ nap

Expt 1281 Blank –

5 wood 1 shellac

1/8 of Naphthalene, 30% solid

100 %

24 made – Transfer –

Printing 100%

78.5 %

Crack 1

OK IIII IIII IIII III

Edge Margin Crack III

Squarish Crack at fold (no. 1)

good Edges –

Test of prints — 1282

Cracked blank - RO. mod outer none inner
1 Very good surface - smooth part - faint RO outside none inside, Surface can scarcely hear

2 good surface - faint RO cracked blank
2 plain - smooth RO Edge none inside scarcely hear

3 Cracked of little RO outer Edge - inner faint hardly hear
smooth side - little RO Edge faint RO inner scarcely hear
all above have Velvet surface

Regulars to compare with 1282.
1 = RO considerable - inner faint RO -
RO very " " smooth side
2 = Bad RO - inner no RO. surface not as good as 1282 "
3 = no RO - inner - faint RO
4 soft RO - " ok "
other side Soft RO inner no RO very little surface -

4th music Rec - Big RO - surface not very good
inner - not very good - too much RO
on 1st for Violin Record -

5 Big RO - too much on start.
6 = Horrible RO. -
7 Big RO
8 Inside soft RO - other very little - surface fair
9 Considerable too much surface for Violin 1 side
other side Rotten surface for Violin

See next page

1282

5 good 1/2 Cotton flock
1 Shellac 30% of blank powder —
Cotton flock dont mix well ~~by~~ large amount in balls or tufts —

24 Transferred

24 OK —

Dont weld very good, needs some lamp black,

Prints 12 = 3 also out cracked blank moulds

OK ||||| ||||| 92% OK

Cracked Margin 1
Very bad blank —

Extra 3

OK 11

Very short fine line crack 1

Good Edges no burst out,

1283 B Duplicate

57 Blanks made 56 OK 1 pullout

Transfers 24
22 OK
2 Cracked

Varnoelds good

Printed 15 —

13 OK
2 Discards 1 Margin Crack
1 Memoic "

Continued from other page:

10 — Bad surface little RO
11 — just passable
12 - Bad surface No RO

10 Good surface no RO
11 just passable
12 Bad surf no RO

Jany 3 1916

1283 Blank

5 wood 1 Chalk 1 Shellac
30% old blank;

24 Transferred
23 OK —
1 Cracked —

96%

Prints 12 pinched + 3 with Tracked

OK - 𝍸 𝍸 ||

3 Extra

OK - |||

100%

good edges

Weldo fine

About same as old regular.

Records of 1283 chalk,

1 RO 2 soft
2 RO 4 "
X
4 RO 1
5 RO 2 · surface poor.
6 RO 5
7 — Loud
8 RO 3 fair —
9 RO 4 soft
10 RO 1
11 RO 4 soft
12 No RO - soft

No improvement over 1282
but shows slight improvement over Reqs —

Soft RO 3
RO 1 - soft

RO 3.
RO 3 soft
RO 3 soft
RO 2 loud
RO 2 fair
RO 3 "
RO 3 loud amf
RO 6 - fair -
RO 3 rough -

1284

5 parts req plate Varnish mixed with 100 parts of Shellac
blank Varnish — blank made
30% Req old blank powder
Blank dipped req way
Weldo little better than Req
61 made — moulded fair
24 Transferred —
OR 20
4 discarded Varnished Chs

Printed 15 —

OR - 10 } cond record
Fed in Chs 3
other 3 broken 6
Cracked edge on smooth side -

1285

10% plate Varnish in
Shellac Varn of Eclipse

24 Transfers Edges fair
OK 20 some [illegible]
4 Seconds Cracked

No quad —

Makes blank too hard

Experiment to see if time of dipping Shellac Electrodes in Concentrated Vacuum makes any difference

480 Blanks dipped in and quick

303 OK
177 Discards 60%

490 Blanks 6 minutes in Dip Vacuum

312 OK
178 Discards 64% OK

Nothing here evidently

Records from 1286 —

No Cracked blank

1 no RO – Rough –
2 RO 1 "
3 RO 3 surf. fair.
4 RO 1 poor
5 RO 3
6 RO 1 —
7 RO 3 Rough
8 no RO "
9 RO 2
10 RO bad
11 RO 1
12 RO 2

no RO – Rough
RO 1 "
Sharp RR short. Surf. fair
RO 2 – surface poor
RO 5 soft surf
RO Big —
RO 2 soft
RO 2 "
RO 2 "
RO big awful
RO 5
RO big

NG for RO & surface

1286 Blank –
5 wood 1 Lac $\frac{1}{4}$ Lampblack
$\frac{1}{12}$ Naphthalene – 38% acid powder

52 made –
Discards 7 – pull outs in Moulding

Transfers
24
22 OK
2 Dis Cracked Varn

Prints 15
13 ok
2 discards feed line Crack

Edges fair – Welds good

1287 Blank

6 wood 1 Shellac 30% alcohol powder
1/8 Naphthalene -

Made 60 Blanks
57 OK
3 Con

Transfers made 24 - blanks clipped
OK 24 100%
Welds good

Prints 15 -
OK 15 100%
good Edge -

Note when 5 wood 1 face 1/12 nap
+ 1/4 Lampblack used.
91% Transfer
86% Print.
Lampblack
not good —

Couldn't Print

only because
Instructions
good
A drop of 10,000
less than
60%

1288
6 wood 1 shellac 30% add powder
1/12 Naphthalene —
56 Blanks made No discards
100%

Transfers 24
OK 24 100%

Prints 15 all together of which
3 on cracked models smooth Each
OK 15 100%

Van worlds good to blank —
Edge fine —

BANNER

1/7/16

1274 - 1/12 Nap 10 ounces

1288 Powder 58 L 7.7 6/4

Frenafd 996

" OK 662

Dis - 374

Pullants 51

Cracked Var 323

62.4%

Something rotten in Blank dept.

We vary our 6/4 by wear test, use

7.7
7.8
7.9
8
8.1

.4 Variation to Just Vacuum

We made an Experiment with same recorder from same Vac Onyx to test if our Dogs were doing work night

1289 — 6 wood 1 shellac
30% old powder

1/16 Naphthalene —
Moved 55
52 ok 3 pullouts —

Transfer
24
20 ok 4 cracked
Weld fair — Edge only fair

Print 15 —
13 ok 2 dw 1 feathering ok
poor print —

Really 14 ok

RO See Moore's book for data

Experiment No 1

Flow 100 plates with 30cc of Varnish, work & bake regular

Transfer ~~[illegible]~~ regular

Print 24 of them.

Some on Tracked blanks

some on wide margin

Music - or if you can find enough tracked blanks to get quick results use them in preference to music

RO2	rough	RO1	rough	
RO1	Rough	RO1	rough	
RO2	little load	RO5	fair	
RO2	Rough W93	RO4	fair	
RO1	fair	RO1	good	
RO1	rough	RO2	Rough	
RO1	rough	RO3	Rough	3629 - ng
RO1	rough	RO1	Rough	
RO Bad	rough	RO3	fair	218 more
RO1	fair	RO5	fair	
RO bad	rough	RO1	Rough	
RO bad	rough	RO bad	Rough	
RO1	rough	RO1	good	
RO1	rough	RO3	fair	

Transfered 47
OK 44
1 pucker 97
2 Cracked

No wrinkles in plates after baking

Thin plates NG

RO6	fine	RO3	rough	
RO5	fine	RO5	good	
RO2	good	RO1	fine	
RO Bad –	good	RO bad	good	
RO3	fair	RO3	rough	ckly moved
RO4	good	RO1	rough	bad moved
RO5	fair	RO1	fair	
RO1	rough	RO6	good	– Bad moved
RO bad	fair	RO3	fine	
RO2	Rough	RO2	fair	
RO V Bad	Rough	RO5	Crackly	107 ?
RO4	fair	RO6 –	good	
None	fine	RO3	good	
RO3	rough	RO Bad	fine	

Apparently no gain in drying 10 hours as against present method

There is some bad tracked moulds in these

makes it worse than really is –

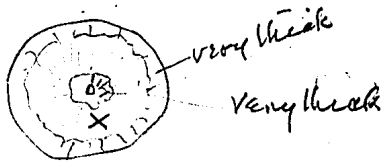
RO cut Expt

No 2 = Put 10 Bird caps aside & let them dry 10 hours including the time on the racks then put in furnace Reg & Increase for Reg Print 20 to 24 on tracked blanks & test for Run Outs

Transfed 14
OK 14 100%

Print 13
12 OK practically 100%
1 Hole due to prevent

Good Experiment -



fine radial marks on thin part
X - most all the Varn ran to
Edges & Center, leaving very
thin shell between edge & Center
One plate had 3" very heavy Center
+ 1/2" very thick outside —
where thin radial marks are
all over & fine grain - those
in thick part are Coarse grain
Evidently plates must get more
drying on rack

Run Out Expt -

#3 - Mg

Run 30 ~~[illegible]~~ Varnish
plates thru regular, but when
you put the plates in bird
Cages Cover over Each
Varnish plate with an
empty Varnish plate
This to Keep alcohol from
Evaporating too
quick in oven -
Transfer & print on
tracked blanks

Comparing Reg as shown in RO 2 E
Acetate amyl is a great improvement
? Doubtful

RO1	good	RO2	V. fine
RO2	good	RO4	good
None	good	None	good
RO1	fine		
RO2	good	RO4	fine
RO1	fine	None	V fine
RO4	fair	RO2	Brackly
RO bad	tough	RO4	good
None	Brackly	RO5	good
RO2		None	fine
None	fine	RO1	fair

Cut the X out

Given 70 — OK 45 —
Six & dust - 16 Cracked

Transfd 20 100%
20 OK

Prints 12 OK 12 100%

Phenomenon

This is so more or less my Regular & must be stopped —

Run Out Expt 4

Make gallon Reg Varnish but replace 10% of the Alcohol with acetate of amyl in it — flow the plates, + Run them thru regular — Transfer + then print 12 on tracked blanks —

The Reg negatives used acts different on these Wengers all others change to red while these keep dead black + colors stripped Cant see them

Notice this morning after being first in Lab one cracked from hole outward + also fuzz from plate — Keeps changing & queer

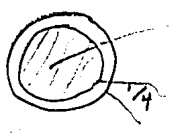
Moore found 1148 - 3 of them
old all Carbolic 4 to 1 mix
20% ground powder in
Young has 3 reg Cracked
blockers

RO6	fine	RO6	fine
RO6	fine	RO5	fine
RO5	good	RO5	fine

Run Out Expts - July 15 1916

4 each
50 mesh screen over

The plate is flowed & this put over to
keep air dirt off



ditto 1/2
ditto 3/4

Ring to prevent Edge
Drying too quick

ditto 1/2
ditto 3/4

RO
1 — ||
2 |
3 ||
4 |
5 ||||
6 |
none

6 RO Louder than 5

fine
good ||||| |
fair ||||
Rough - |

no fine

Edges fair

Blank too soft
nearly all poor
print on Edges

Experimt Blanks — #5

100 blanks, 4 wood
1 Shellac, 30% old powder
well mixed —

Transfer — Hermans or
Polished steel —

Print 24 — several showed
be permitted on
tracked ~~blanks~~ moulds

Transfer 24
22 OK
1 Ckd
1 mechanical

Print 6 OK
6 poor print
cracks

Expt Blanks #6

Dup of #5
Except 4½ wood
1 Lac 30% old powder

No use test Records
gives on Edges
too soft.
Wants very
hard blank

Notes –

Find a fine powder which will float over varnish on plate or watch –

Solvents to add to Varnish

Solvent Naptha over higher alcs
Low BP Paraffins – Lower alc ethers

Oleic acid

Benzaldehyde BP 160 C

glycerine

Glacial phos acid

Camphor Oil – Light & heavy

Cedar wood oil 16 Cents
Eucalyptus – 50 "
Lavender (garden) 80 "
Origanum – 25 "
Pine needles 75
Safrol 27
Artificial Oil Sassafras – 24

Benzenesulfonate Soda

Camphor

Pyridine BP 116 C

Alcohol BP 78.5 C
" Allylic 96
Amylic 131
Benzylic 200

Fusel oil - $3.75 has several alcohols in it.

Monochlorobenzol 132 C
Rosin Oil.
Linseed Oil
Castor -
Canada Balsam
Epichlorhydrin - 119 C
(Ortho) Ethyl Formate 145 C
Ethyl Oxalate 186
Ethyl Benzoate 136
Nujol
Safrol 233

Think the Varnished was all Cracked before went into oven —

Run Off Test:

Moore — Expt 7

Take 2 bird cages full with good plates, even flowed. set them aside in warm room for ONE WEEK

The bake, transfer, + print

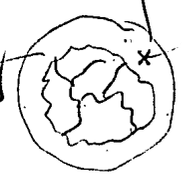
Reg —

Plates were set aside 2 week

Then Baked —

Started Cracking moment get out of Oven —

All Cracked + lifted in Big Chunks



Veneer Extraordinarily Brittle

Phenomenon

Note at bottom of dish the matte

is this resin settling out because alcohol no longer can hold it in solution

lies must be on our reg plates, - if so

A better solvent than alcohol should be added to alcohol to collect + clap matte —

1. pin so far old Solvent Nap 1/2 + al 1/2 dont crisp so much + is even

on other hand our sol nap 1/2 + al 1/2 is very bad, stuff settles out, creeps + breaks —

1/2 alcohol 1/2 Monochlorobenzol Resin dissolves fairly well when on butter dish over water bath on hot plate. Resin precipitate at bottom after evaporate —

1/2 al 1/2 our Solvent Naphtha does same thing —

Both the Monochlorobenzol + our Solvent Naphtha are very poor solvents of Resin —

This leaves resin more solid than the others our Sol Nap test Camphor oil very sticky — amyl acetate soft —

With the Solvent Naphtha (old lot) from Barrett — dont dissolve much I think but 1/2 Nap 1/2 al ok. dont notice it runs much on plate creeps however — even

1/2 Barnett Nap 1/2 al. is very fine
Even, I notice some streaks at
bottom very faint not colorlic
but there may be in dark itself

Our Sal Nap actually seperates
from the Solution

Camphor Oil good solvent
Amyl acetate Very good solvent

Amyl acetate Solution, runs
up badly on side of
dish barely after pouring
on ~~[illegible]~~ (streaks + bare)
spots like alcohol
afterwards Even up

Camphor oil dont creep
but that is because its
not evaporating rapidly
Later its creeping &
streaky—

RO

Bad |||
1 — | —
2 — ||
3 ||
4 — |
5 — |
6 — ||||
none

Surface

fine |
good |||
fair ~~||||~~ |||
Rough || Bad Mark

NG

What is 1299 Blank

This is NG as Moore says it flows

It is Very bad Weld

Run Knife under ½ inch

NG

Run Out
Expert #8 1299 Blank

Made 24 Transfers on 4½ wood 1 Lac 30% ISO powder —

Dont Dip

Print — Tracks Moulds

Transfer 24
22 OK
2 Chipped Edges

Weld poor - chips off

13 prerolled

all Cracked at Edges —

Blank Too Rich floors

from the rough Experts think light Solvent Nap old from Brassell is good to mix with Reg Varnish in place of some of the alcohol.

Hoffman making a reg Var. with 25% Solvent Nap (bad) in

This works good on little plate its better than Regular — dont gas so much — is lighter & very little matte or streaks —

Make a large Experiment When Can detect Xylol + higher off to separate

Experiment # 9

Take ½ doz band records different tunes

put transfers over them

then print with a tracked mould —

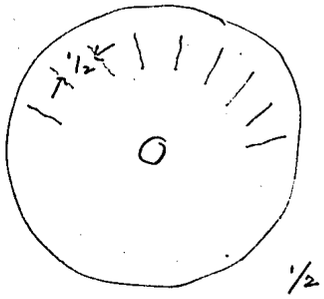
Want to see if we can hear the music on tracked blank ——

Big RO - but should be put on better blank
will try it on
48E

1 On 1293 RO is there but not more than #3
2 Dont notice much -

Dont do much
& varies -
Reg Var Reg Sol

Expt #10



Dents made on transfer plate
1/4 long 1/32 wide
1/2 depth of an reg dent -
& 1/2 way around

These are to be made both ways on the face & also on some plates only on the backs

RO II 1 - IIII 2 III 3 II 4 I 5 6 None		Fine good III fair IIII II Though - I

Too much pressure on Reg blank & Reg V Very bad RO & Very poor surfaces - Springs back due to stand up slightly of tube & too not conform to Hole

Expment # 11

Take 2 dozen ~~transf~~ plates with very bad radial marks that you know will give horrible Run out — make Transfers & then print Regular but before you Cool, run pressure up to about 2200 lbs & then Cool under that pressure - This Experiment is to see if we can press out radial marks

12 Transfd all OK
12 Print " "
on Reg blanks -

RO
1-1
2
3-1
4-1
5
6 1
none

Oven — 39 plates
OK 4 or 3
Rejects worthless
Reused 23

Fine
good III
Face
Rough 1

Note this

The Extra 6/4 in 12 is cause of raising from plates as to 13 which had less 6/4 & did not raise

This is a Phenomenon & Thoroo Care must be used with 6/4 — Naphthalene would probably be better than adding Extra phenol as 6/4 probably not need be so dehydrate

Expt 12 E

Note enormous improvement in surface in 13 as compared to 12 + even Var plates to due to use of 29 phenol

Hoffman — You use 15 to 16 free phenol resin + add phenol to bring to 22. 6 Nap

Make gallon Varnish but instead of adding phenol leave it out + substitute the same amount of Naphthalene ——
use 7.9 or 8 6/4 as usual

39 plates flowed —
OK 4
35 discarded

Reg blanks
Dipped —

Varnish raised from plates = after baking surface good no radial wrinkles — All are wormy small
All Even plate

Print 2 ok —

Note raised plates on high amount 6/4 as compared to 13

Welds good

RO
1 - 1
2
3 ||||
4 |||
5 ||
6 ||||
None 1

Even - 39 plates 31 ok
Bubbles 8

Fine 1
good ||||| ||||| |||
fair ||
Rough

Var Works good - plates good
Vus 2.45 - Room 82 Var 68

Pretty good surfaces — but RO are still there but most weak —

Edges good, could be better
Some has very small pull out, good weld to blank but blanks should be tougher so Var dont pull off tape

Should try some not dipped
Weld is nearly as good as old Carbalic blank
Think its good enough —

Expment 13 Wear test 250 - slight grey in spots OK - 50 Thin pad [illegible]

Dup of 12

Duplicate this using
7 : 6/4 — Naph

This is on 1293
Blank 22 E

Flowed 39
31 OK, Blanks dipped
8 Discard small bubbles —
Can use —

No wrinkles — wavy - All Even plates,
Try wear test on this on account low 6/4

12 transfers all OK

1293 blank

11 Prints
1 Pin Hole -

31 Baked

12 Trans OK
11 prints all OK 8 Dis. small bubbles
wavy all even plates -

RO
1 |
2 ||
3 ||||
4 ||
5 ||
6 ||
now ||||

Fine
good
fair ||
Rough ||||

Entirely too rough - Horrible ~ looks bad surface — RO are not bad but it shows them —

Moore
Expt 14 E

Press with smooth plate ~~some~~ 1/2 dipped ~~plates~~, blanks Then print on tracked blanks, want to see if Run Outs —
Dont Bake the dipped plates. ~~black~~ - black

E 15

RO
1
2
3
4
5
6 ||||
none ||||

Fine
good
fair
Rough ||||| |||

E 15 1/2

RO
1
2
3
4
5 |
6 |
none -||||| |||||

Ruff ||||| |

Note improvement dipped blank by Baking

Horrible surface as is to be expected but RO are extremely faint & 1/2 have any Chrome Most RO & on plates or Combination of wrinkles & a soft blank

Moore. Expt 15 E

in oven 6 hrs 180 deg
2 1/2

Dup of 14 E

Except bake the dipped blanks same as plates
req schedule —
No Transfers on

15 1/2 E

Held 9 hours 1 1/2 hour
230 deg

No Transfers on

15 1/2 Seems to show baking high is better than baking low — if we bake at all —

Moore – 16 E

(1) Press dipped ~~plates~~ Blanks 12 of Chain between polished plates. press Req. 500 lbs — Then remove + put regular transfers on at 500, then when 15 minutes is up Run pressure up to 1200 lbs hold for 1 minute + Cool

The theory here is that the putty like free phenol is to graft + allows Condensate to spring back & I substitute a hard brittle Copal to demonstrate the putty like substance —

Try Olibanum Tears	15 c	
Senegal	20 c	
Kadaya	15 c	
Euphorbium	18 c	
Myrrh	17 c	
Dammar	15 c	
Kauri –	15 c	
Shellac –	16 c	

Given 30 pebbles and left plate 25 ground 2 cled like Sandarac

#17 Veneers all left plate acts like Dandarac + probably could replace Dandarac to prevent sticking to plate – Copal 1 Reg Rol ~~[illegible]~~ brittle about same as good Reg

Hoffman 17E

Use 2/3 Regular Resin

15 to 16 preephenol – 1/3rd Number 1 ~~[illegible]~~ Copal – ~~1st trying of~~ ~~Usually 1" is good & valuable~~ ~~in alcohol~~ – to 100% solid – powder Copal up finer like the Resin -- Use 8 6/4 + other regular ingredients

Make 1 gallon use 4 or 4 1/2 to 1 lbs if you have clean flow transfer to percent on tracked blanks – Dont use dipped blanks

Phenomenon

Inactive Reg put on hot plate dried slowly & then Condensed all night on plate direct. Has dull surface one side (bottom) Top is shiny no waves or mottle

Dup with glacial acetic bright both sides & not near as brittle tougher bends more

S S
1 1

Hoffman 18 E

Dup of 17 E

But substitute Sandarac

Moore says he has stoned them off & printed & they were there just the same showing trouble was in bottom.

When you use fine Emery – The streaks radial shows plain on top =

Phenomenon

It looks as if the worms & streaks & radial corrugation was on the bottom & not on the top as they appear & are due to the settling out of something in the Varnish

Raise up as you can stone off the Top & see them on Top &

Tracked

RO4 - good 5
RO5 "
RO4 "

RO3 good sand
RO6 "
RO6 - very good

Mixture

RO3 Rough
RO5 fair
RO5 good
RO4 good
RO6 good
RO6 fine
RO big wrinkles big radial marks 5" of Edge. not due to Crank
RO6 - fair
RO6 - fine
RO big RO. Radial marks
RO6 good

RO3 rough
RO6 - good
RO3 good
RO3 good
RO6 Little rough
RO6 fine
RO4 fair

RO	fine
1	
2	good
3	
4	fair
5	
6	Rug
no 1	

Demit

RO6 good
RO6 good
RO6 Rough
No RO Little round

Hoffman gives one 1293 63% Hum 180
Anchor 34% Hum 180

1293 —

Phenomenon

5 to 1 2 Chalk —
No ground blank —
Moulded 99 o/o
100% ok blanks - 7 to 1
Transfers 24 87.5
OK 21
good edges —

Prints.

find out how this chalk was mixed

Mixed with shellac Varnish with the wood —

Something in this —

Chalk stops Sprouting of the fibre —

only bad ones so due to Varnish wrinkles —

Estimated by Eye

Solvent in Alcohol

Soft Mexican American Asphalt	5%
Gum Giddu	50%
Dammar	80
Senegal	50
Copal #1	100
" #2	80
" No Number	80
Kauri —	5%

RO bug
RO 2
RO 3

RO bug
RO 2
RO 2

1292

4 wood 1 Lac 2 Check -
30% old ground black
98% OK in Moulding
79 moulding OK 1 hollow
moulding
Transfer 24
21 OK
3 Cracked Var

Prints

40
1.20
2.00
7.20 to 1

Acetic Acid NG

Oven – 35 plates – 180/2

Bubbles 13
Rame 1
Wrinkles 3

19E Expt

Hoffman 1/2 gallon

Reg Varnish to which is added to the alcohol

4 parts of Glacial acetic acid, to 100 Resin

~~of alcohol is~~

~~140 you add 5 parts,~~

~~of glacial acetic 145~~

~~parts of Alcohol and together~~ —

~~Spread~~ Transfer on $4\frac{1}{2}$ to 1 blanks
30% old powder

not dipped.

Print —

Var — sent back as Var was
Lumpy returned saying that was
its nature of it No +
Vs 240 — Room 80 Var 70

Damar Contraction large
Cracks the Condensite

Phenomenon →

Oven 31 plates 31 Cracked

20 E Hoffman

Dup of 17 E

But use gum
Damar +

All shrunk & cracked in every
direction, Extraordinarily Brittle,
Very thin condensite,

~~Thus Experiment shows, we~~
~~must first & exact Keep~~
~~but also Varnish & Varnish~~
~~glass & Condensite~~

No 1 Copal acts good, acts
like Sandarac. Veneers all
left plates —

21 E

100 Blanks made entirely out of Charcoal ground fine — Use 5 charcoal 1 Lac —

Dave these blanks & choco to me —

RO1	RO 2
RO 2	RO 3
RO 3 buckle	RO 2

One side of blank seems to be softer than the other side

1291 _

6 wood 1 lac 1/2 Chalk
30% alb powder
51 made 49 OK

8.28 to 1

Transfer 24
OK 19
Dis 5 Ckd Var

Prints 15 15 OK

Very poor surface
Old ground blank
Wherever cwcd makes
Records bad -

RO 3 good lacing | RO 4 – Radial marks sometimes left on buckle – [illegible] marks only much worse –

RO 2 fair lacing | RO 2 fair lacing

RO 6 rough | RO 2 rough

RO 1 very rough | RO 1 very rough

RO	Fine ||||| |||||
1 = |	
2	good |||
3 ||||	
4 |	fair
5				
6 ||||	Rough
none |	

Weld good

Edges fair –

This looks as if 7 6/4 no free phenol + 6% Naphthenates as heavy as good as 22E

Very fine – 1293 + Reg Var – dipped

Only trouble is RO on account probably of too much wood or not enough lac

22E We have 700 of these Blanks –

5 wood 1 lac 2 check

no old powder

Duplicate of 1293. Blank Reg Var 1256 –

no ground blanks Dipped –

Make 500 of these blanks

Dont use old powder –

12 Transfers

11 OK

1 pinhole 100%

Printed 6 –

6 OK – 100%

Blanks little thicker than Reg

not so thick as 23E

No change blades on loading machine packs mess in loaders, packs close in small pocket

3/16 scrape off weight 441 gauge 235 –

719 Blanks made –

RO

1 ||
2 |
3 ||
4
5 |
6 ~~||||~~
none |

Fine ~~||||~~ ||||
good ||
fair |
Rough –

Not quite as good surface on Gun RO as 22 E

Welds good – very

Blanks of 100%

Edges Crumbling (a few) may be due to it being much thicker than Reg
Produced in thickness it might not Crumble
We'll Gallery try some thinner
Weight 408 – ~~[illegible]~~ leave mould fair
1/16 scrape off packs mass in loading Machine

23 E Hoffman 1307

~~1296~~

Dup of 1293 Black

Except 4 Wood 1 Lac 3 Chalk
1307 Hof
Do not use any old powder –

Make 500 of these
23, Expt Blacked [illegible] Reg Vac 1266

Transferred, 12 all OK

Prents 6 ~~all~~ 5 OK 100%
1 Cracked

50% of records have Edges Crumbled out for 1/5th circumference – not Enough fibre to hold it – may be or too chalk – Wants longer fibre or more Lac
Blanks Moulded thick –

Think it wants more shellac, too dry
Chalk drinks up shellac

24 E

RO ||
1 - ||
2
3 |||
4 - |
5 ||
6 - ||
None

Dipped

Fine |||
good ~~||||~~ |
fair ||
Rough |

Edges not very good
not thick blank —

not near as good for RO + far below surface 1293 22E - Welds good

RO 25E

1 - |
2 ||
3 ~~||||~~
4 ~~||||~~
5 |||
6 ||
None ||

1 Not dipped

Fine ~~||||~~
good ~~||||~~ ||||
Fair ||||
Rough ||

Pretty ~~good~~ fair weld
not good enough -

good Edges No RO + Fine on one broken Moulds

good deal trouble is with moulds -

~~Dipped~~ has poor Edges CO. Like not dipped
has good Edges. Drip soft stuff may cause a flow -

24 E

4½ wood - 1½ old blank powder 1 Lac
mix all with blank Varnish -
Dipped

Make about 100 blanks or so.
Do not dip but ½ the blanks
Transfer -
+ print Reg Var 1256
Reg Var - Transfd 12 12 OK
Print 6 - 5 OK 1 very fine - Cracked
Damned old powder queers it

~~25~~ 26 E Duplicate of 24 E
The other ½ of the 100
blanks are not to be dipped
Transfer
Print Reg Var 1256
12 Transfd 11 OK
1 Ckd

Blades lowered 1/8 probably mean pks loose in press
1/8 scrape off weight 376 grams over heavy moulds clean

Jogelgram in Ether

Borate Ammonia Sol Alcohol

Borate Ammonia Magnesia "

$CuOH$ in Ammonia "

$ZnOH$. in Ammonia "

Shellac Var mixed in every proportion with Reg Varnish, is NG Bubbles, sticks to plate — Rotten —

RO		Surface		
RO		Fine		
1		good		
2		fair		
3		Rough		
4				
5				
6				
None				

25 1/2 E

Moore Dave 200 plates with Wrinkles radial on Run them thru Oven I want to get a black hard enough to smooth them out in freezing & painting

RO4	rough	RO3	fair
RO3	fair	RO1	fine
RO1	fine		
RO3	good	RO5	fine
RO1	rough	RO Bad	good

RO 1	fine III
1 III	
2	good II
3 III	
4 I	fair II
5 I	
none	Ruf II

Wrinkles dont disappear on 1226 blank - I suppose this is reg blank ask Moore - try it on 1293 + 48

Wrinkled varnish plates
Very bad wrinkles
Var 1255 - 9 -
Transfd on 1226 blank reg Oakfield
put paper under wrinkles to mark the places

Transfd 12 91%
OK 11
1 puncture

Print 11 -
OK 4
3 poor print margin
3 Cracked
1 feed line -

Note Cracked on print + pull out on Transfer

RO

RO ~~Bad~~ III+ fair	RO —
RO 1 = ~~IIII~~ good rough	RO 1.11 fine rough
2 = III good rough	2
3 II good	3 = I rough
4 III good	4 II good fine
5 II good	5 II good fine
6 III	6 = II fine
0 I	0

Surface

fine ~~IIII~~ I	6
good ~~IIII~~ ~~IIII~~ IIII —	13
fair ~~IIII~~	5 —
Rough III	3

It welds after Cut
not good Enough —

1296 Varnish

Special dipping Varnish made of Shellac Same as Req

Dipped 60 1226 blank

Transfer 60
58 OK
2 pull outs

Poor weld to blank

Prints 15 —
13 OK
2 Ckd Marque

Male Ckd on 1226 w this req
blank

Bad
1 — |||
2 — |
3 — ||||
4 — |||
5 — ||
6 — |||
none — ||

Fair |||
good ~~||||~~ |||
fair ~~||||~~ |
Rough 7

Didnt record 3 bad sides of Cracked blanks in Chart.

1267 Blank
5 to 1 mix $\frac{1}{2}$ para
30% old blank put in dry
Inspected 432
386 OK 94.6%
23 Cracked
7 Holes
16 chipped
Dipped blank –
Printed 12 all ok
Note Cracked on ~~rough blank~~ 1267 blank (what is 1267)
~~[illegible]~~
~~[illegible]~~
Welds fair — good as Rag
ask Moore

RO	fine ||||
1	
2 ||	good |||| |||
3				
4 |||	fair
5	
6 ||	Rough
none	

Edges 1/2 of them broke out —
Thick blank little above standard,
Welds good but contraction pulls up + split blank $\frac{1}{32}$ in —
powder when pressed at 20 lbs small press showed cracks in — no scrape off
Weight 450 — leave moulds dirty —

26 E Dup of 1293

Make 75 or 80 blanks

3 Wood — 4 Check 1 Lac

Req —

Blanks no pressure small press 100% OK Unsafe sinking

Dipped few, Save the others

12 Transfers Req Var
Req schedule
11 OK —
1 Dis Mechanical

Prints 6

4 OK
1 imperfect margin
1 poor print

RO
1
2-1
3
4-1
5
6
none

9

towards 450 no pressure
blank loading Mar known
1 inch shows cracks in press
at 20 lbs, pressing breaks below wounds
ring no damage off-loaders
middle dirty 1

fair 11
good
fair
Ruff

Ought to put more Lac in + make Chamm
blank hot

Blanks dont give — Makes
poor prints Consequently
too much Chalk Makes
springy and
Edges Crumble out

Phenomenon
The less the wood springs so as to
not spring + making a hard blank
the smoothes the surfaces + less
the RO — No Mottled surfaces show on
Record — Defects are Edges + poor prints

27E Run of 1293

Make 75 or 80 blanks

2 Wood - 5 Chalk, 1 Lac

Dip a few - for test

Blanks no pressure on smooth press 100% ok no strike off shows cracks with 20 lbs + press Blanks stay off break easy

12 Transfer Reg

Reg Schedule

Note Cracks { 8 OK
4 dies for Cracks

6 printed
3 poor print
1 imperfect Marque
2 OK

RO
1
2
3
4
5
6
Now

Fine
good
fair
Rough

No prints, Transfers Kan Cracked
also blank Cracks, fair ~~the~~
welds strong so it pulls off
1/32 of blank — It is rather
strong more than I thought
possible nearly as much
as a Victor Record
Very thick —

NG

Blades lowered 1½ punch below moulding
showed cracks on small press at 20 lbs well that pressure
it was moulded no scrape off
leaves moulds dirty 103 blanks made

28E Dup 1293

Make 75 to 80 blanks

1 good 6 Check 1 Dec
Dupped —

Blanks no pressure in small press 103 blanks all ok very soft Grain

Dup a few for test, Save Balance

Note, Cracked NG

~~Wood too small~~

Its not that wood is too
small there is not enough
Shellac

RO
1 -
2 ||
3 |||
4 |
5 ||||
6 |
none

Fine
good ||||| ||||| |
fair |
Ruff

Very light blank — quite thick blank
Var Welds good —
Wt 360 — 20 lbs small from Lowered Blades
1/8 5/16 scrape off
3/8 calliper lawnmowed clean
660K 6 dis mechanical defects

29 E Make 75 to 80 blanks
5 wood 1 Charcoal
1 Lac Mix all with
Lac Vari — Charcoal
should be as fine as
old blank powder
Dip a few for test
Place the others
Transfer 12 on Reg V Reg 6 ch
12 OK
Prints 6 6 OK
Blanks breaking 100% soft spongy
Thick blank
Edge fair 25% of Chin broken out

RO
1
2 1
3
4
5 1
6 1
Noms ||||

Fun ||||
good 1
face
Ref

Edges crumble out all around
welds good but blank fractile
pulls away

Only trace of Mottle.

Something that does away with
surface does away with
the Run outs,

30 E. Make 75 to 80 blanks
Dup of 29 E
But 4 wood 3 charcoal
1 Lace

Blanks 20 lbs
press in small pot
7 ok
Very pot
Broken
cracked
at the

Dup a few for test Lace
balance

14 Transfer Reg V Reg Schedule
4 OK
7 - Cracked — Mole Cracked
Prints 3
1 OK
1 Chd on Mangnet Center
" in Center —
Blades reamed 1 1/2" on loaders
packs fair in press
1/8 scraps off wt 375 clean moulds
Edges break — soft blank
102 made

RO
1
2 |
3
4 ||
5 ||
6 |
None ~~||||~~ |

fine ~~||||~~ |
good ~~||||~~ |
fair
Ruf

Edges Mealy
Welds good but blank seperates
1/32 - no cohesion —
3/8 blank
Blanks 20 lbs in quad
pieces 77% good
Discards crumbled Edges

31 E
Dup of 29 E
But
3 Wood 4 Charcoal
1 Lac

Dup a few for ~~test~~ & avg
balance
12 Trans Reg V Reg QCR
7 OK —
5 dis ckd Varnish
nots Cracked

Print 6 —
4 Cracked Center
2 Chipped Margin —
Blades lowered 1 1/4 punches close in small pieces
1/8 scraped off wt 420 ss gouged over
leave moulds clean
84 OK 25 discards mechanical defects

Blades lowered 1/2
packs mac in mould -
powder pressure below moulds
1/4 to 5/16 gauge
heads moulds clean

Soft blank - breaks around edges
in Extracting
43 OK
32 descends broken edges -

Charcoal eventually
takes up more lac
soaks it in -

NG

Blank 50 lbs pressure
average pressure
57/50 OK
breaks when
Extracting

Note 30 31 + 32
as Charcoal increases
Cracks increases
too dry Lacquer

No
32E Made 74 to 80
Dup of 29E

But use
2 Wood 5 Charcoal
1 Lac

Dip a few for test, save the
balance

Only Transfers
All cracked Blank
gives too much -
trouble - 3/8 thick
3 stuck to plate
NG

RO
1
2
3
4 ||
5 ||||
6 ||||
none

Fine ||||
good ||||| |||
faer
Rough

Edges – OK good
Welds good

Var – This Var works good – plates fine –
Vro 2.45 – Rtm 79
Var 60

Run wear test on this –
Low 6/4

~~Should Dup this on~~
~~1293 blanks~~

Note bubbles
in OVEN

Pattern
32 – 16 OK
Bubbles 16

33 E

Wear test show a little wear at 250 – none at 150

~~Duplicate of 12 E~~
~~Except use twice the~~
~~amount of Naphthalene~~
~~that you did use in 12 E~~
~~Keep Resin + 6/4 the same~~

33 E
Dup of 12 E
Except use 6 3/4 6/4
on 1293 blank E22 – dupped
Transfers 8 8 OK
Prints 6 – 5 OK – 1 imperfect

Ro
1-1
2 ||
3 ||
4
5
6 ||
none |||

fine |||
good |||| |||
fair 1
Ref

Welds good,
Edges fair

150 Times
OK for wear

Oven 13 plates 20 ok
uneven
Rubber
Dust

Test this for wear low 6/4

Should duplicate on
1293 Blank
Var — works good — plates good
Room 82 Var 69 — Vis 2.39
Note less bubbles as 6/4
Comes down

250 Times wear, Best OK for wear
bubbles

34 E

Wear 150 ok

~~Dup of 12 E~~
~~Except use 3 times the~~
~~amount of Naphthalene~~
~~you did use on 12 E~~
~~Keeping Resin + 6/4~~
~~the same~~

flowed 33
wet good
Baked 20
Dry 13
10 bubbles
3 uneven
Very complete

34 E

Dup E 12
Except use ~~7~~ 6 1/2 6/4
10 Transfers blank #293 E22
Dropped ~~[illegible]~~ Reg OK
all OK
Print 6 —
3 ok
all comes { 1 slightly chipped
1 poor impression
1 poor print

Trans 10 all ok

RO — Fine ||||
1
2 | — good ||||
3 |
4 |||| — four
5 |||
6 ||
None || — Ruf

~~Vars - flowed far more better than any we ever had all plates perfect~~ no patch — Room 85 Var 65
Vis 2.29 —
1293 blanks were dipped
12 Transfer 12 OK
6 permits 6 OK

Varnish 1318 Hoffman
Run wear test,
good weld,

OVEN - 31-26 OK
Bubbles 4
Raised 1
Very Even

~~Var - flowed far better than any we ever had all plates perfect~~
~~Room 55~~ Var 64

Wear test 250 hours
OK. very slight
shine off cup rich part,
Band.

35 E — Wear test

~~Dup of E 12~~
~~Except use 5 times the amount of Naphthalene you did use in E 12~~
~~Keeping recent 6/4 the same~~

35 E
Dup of E 12 — 1293 blanks
Except use 6 1/4 6/4

Transfer 12 OK
6 permits OK
works best of any so far
plates OK
Bubbles 2 6
5 Dry 4 bubbly
1 Raised
very even plates

RO
1
2 1
3
4 11
5 1
6 1
None ||||| ||

Time ||||| ||||| ||

good

face

Ref

Oven — 32 - 240 F
Bulbs 6
Lamp 2
Very Even
Look worm
No added phenol
about 5% Naphthalene
+ only 6% 6/4

Run wear test, on Band —

Very good, Wear Test 250 Times OK

Var - works fair few small Holes in plates
Room 79 - Var 68, Vis 2.42 ~~all~~
~~What Black Coat case~~ 1293

There is good Varnish
apparently fit
Stands Wear test 250 Times OK
Note bubbles diminish as 6/4 comes down

Note 35436 - Surface + RO
+ yet on 1/4's def 6/4 - Think this would
make all the difference something else
wrong

36 E

Wear test

~~Dup of E 13~~
~~Use twice the concentration~~
~~of Naphthalene speed dry~~
~~use on E 13~~
~~Keep Resin + 6/4 the same —~~

36 E Dup E 12
Except use 6 6/4

Hoffman Number 1319 —
1293 blank dipped
12 Transfer
11 OK 1 small bird
6 Print 5 OK 1 poor print

Note the appearance of birds

~~34E~~

~~Drop of E13~~

~~Use 3 times the~~

~~amount of Naphthalene~~

~~you used in E13~~

~~Keep the Round 6/4~~

~~the same~~

1675
5000
6675

16750 (2.50
13350
34000
33375
6250

38E

Dup E13

Use 5 times the amount of Naphthalene you used in E 13

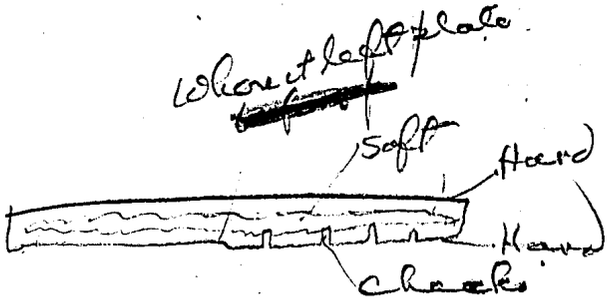
Keep Rein + Dup the Dame —

Hoffman Uses in blank Var

16 3/4 Lac
50 alcohol

about 26% of Shellac in Var

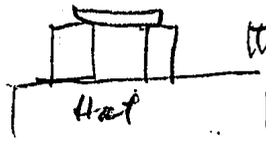
Use 66% Alcohol Var to 100 lbs wood



~~Dozen varnish plates, bottoms laid on stalk to keep that air from~~

Note —

I notice when a varnish is thick & flowed on small inch plate & well air dried & put



thus — The top is ok the bottom face shrinks & checks off circular strips hence bottom is full of checks or loose cracks

RO
1 — III
2 III
3
4 IIII
5-1
6 I
none

Fine II
good ~~IIII~~ ~~IIII~~
four
Rough

1293 is not quite hard
Enough to press out the
wrinkles it wants
48 E for that

37 E 1/18-1/16

Use 1293 Blank —
blank Dup 23 — dupped
Transfers Make 12
with plates that have
wrinkles —
Use req scheduler Transfer
+ permit

1—18—16—

Special 1293 — 22 F

50 lbs pressure on small press
450 grams

No change in blanks on loading machine — powder packs nice in loaders

Powder packs close in small press 3/16 scrape off on turn table

Weight of blank 446 — 436
gauged-averaged 230 to 240
Color light —
Leave mandrels fair —
719 made no discards

RO || Fine
1 ||
2 | good ||||| |
3 |
4 | fair
5
6
None Ruf |

Looks as if raised varnish plates used
Records all covered

NG

Good Edges ~~[illegible]~~
Wood good but blank pulls of 1/32

no blank deserends
1/16 scrape off

Something Wrong in
Uhs Expmt

38 E

Dup of E 23 |.. 1293

Use 4 wood 1 1/4 shellac

3 Chalk

Dip the blank

Use Reg Varnish plates Reg schedules
Moulded blank 20 lbs pressure in small ~~wood~~
Press – 86 blanks made 100%
Reg Var Reg stab

12 Transfd
5 OK
7 4 Chd 3 slight bubbs –
Something wrong with plates

5 Prmt 5 OK Note Cracked

30 with more shellac No cracks

RO — Fine IIII
1
2 I — good IIII — not soft=sharper
3
4 I — Face III good but sharper
5 III
6 IIII
none IIII — Ruff

No raised seen
Edges - ½ crumbled but not bad

Welds good

Blank
Lowered blades Leader 3/16"
only scant range eff.
Weight 446 gauge 240
leaves mould fair

118 OK 2=dies pull out
1 mechanical

Var - works good - plates
good - Vio 2.45 Room 82 Var 68

1-18-16

39E

Drop of 23 E 1293

But Use 4 wood - 1½ shellac
3 Chalk —

Dip the blanks —
Use regular Var plates +
Reg Schedules
Moulded 20 lbs pressure small press
99.1% good 120 moulded
Powder in hard cakes when taken from
Dryer
Transfers 12 Reg Var Reg Sch
11 ok 1 chipped Center
Print 6 Print
5 ok 1 poor print

RO fine ||||
1
2 good ||| — sharp —
3
4 || fair
5 |||
6 ||||
None ||| Rough

Oven 80-80°C
very Even
wormy

Weld, good.

Edges - broken out some in most often

~~Var Vis 2.16 Var good plates good~~
~~Room 82 hammer~~

Var - lays even on plates, dont creep like out regular, no veins looks same all over, Room 82 - Var 70° Vis 2.37

40-E

1293 blank

Make one gallon Reg Varnish but instead of bringing to 22 free phenol bring to 24 free phenol using 8 6/4

1293 blank = Hoffman V 1323
Transfer 12 120°C
Print 6 made
3 OK
3 poor print on Heavy

RO — Fine ~~IIII~~
1
2 | — good ~~IIII~~
3 |
4 || — ~~fair~~ ||
5 |||
6 ||
None ||| — Ref — Oven 80 ok 80

Weld good

Edges - fair - few chipped out,

Var Dries out even, mottled, spokes radiate from rim - plates good
Room 82 Var 65°

Note wrong from sheet & new report

41 E

Dup of 40 E
But use 26 free phenol
Still using 8 6/14
1293 blank

Transferred 12 Rep ~~[illegible]~~ ok
11 ok
1 ckd Var

6 Print
4 ok
2 poor print · Kaffen V. 1324

Note Crack

RO	Fine |||||	I note would look that Camphor oil not soluble in alcohol that accounts for slight cloudiness
1		
2 1.	good |||	
3		
4	fair 1	
5				
6						
None |||	Ruf –	Very good Varnish – as far as surface goes –

Welds good
Edges fair

Varnish flowing Var. light green looks muddy & oily wavy – thin streaks across center of plates – patched 26 plates
Weather fair –

After baking all look worm
Crystalized look –
74 plates 4 bubbles 6 Cracked 1 Dent
ok 63.

OVEN – 74 – 63 ok
Bubbles 4 Cracks 6
dust 1 Crystalized look worm

42 E 1-18-16

Make One gallon Varnish

Use regular proportions but substitute Enough Camphor Oil to Soat Twill be 5% of the Resin
To be used on E 22 1293
blank dipped 12 Transfer
6 prints

Hoffman 1325
Transfer 12 all ok
Prints 6
4 ok
2 poor prints on margin

Edges – fair –

Var. light green looks muddy oily plates wavy thin streaks across center
Room 82 Var 67

RO 1 — Fine ||||| |||||
1 -1
2 — good 1
3
4 |||| — fair 1
5 ||
6 1
none ||| — Reef -

Welds - good
Edges - fair -

Var, Dark Green on Color, works good, plates good Room 82 Var 70
Vis 2.16

Oven - 78 - 70 good
Bubbles 5
Raised 1
Cracked 1
Wrinkled 1

1-18-16

43 E

Make one gallon Varnish Dup of 42 E but put Enough Camphor oil to be 10% of the resin
Use on E22 1293
blank dipped -
Make 12 Transfers & 6 prints

Transfer 12 12 OK
Print 6
2 OK
4 poor prints on Mannequin

Hoffman 1326 - Var
~~Var, very clean works good - plates good~~
~~Room 82 Var 70~~

RO 1 — Fine ||||/ |||
1 ||
2 ||
3 | — good ||
4 — fair |
5 |
6 ||||
None | — Ruf |

Oil squeeze out + shows on Record

Van Like 43E

Weld good – Edges fair

Camphor Oil is Good

Must get things Polished in alcohol

Oven 79-460K
Cracked 32
Bubbles 1
Worm, Crystallized Cork

Oil used in Oil is Good

~~Van Like worked unusually good but creep of brank 79 – 32 Cracked all look worm + Crystalized 1 bubble~~

44E

Dup of 42E
But put enough Camphor oil in to be 20% of the resin.

To be used on E22 1293 blank — Dup blank
Make 12 Transfers + 6 Records

Transfers 12
11 OK
1 Mechanical

Prints 6 –
5 OK 1 poor print

Hoffman 1327

RO		Fine ~~IIII~~ III
1	II	
2		good II
3	I	
4	I	fair II
5	I	
6	III	
None	IIII	Fluff

Cant understand the 2 big RO

plates all very even, very warmy look fine + 100% plates -

45 E

Make 50 plates with Reg Varnish but use 50 CC of Varnish

Transfer 12 on 1293 E22

Print 6 -

Transfer 12
120K

Print 6 -
60K - Reg Var

long RO & a short wrinkle RO sharp

RO	fine
1	
2	good
3	
4	fair
5	
6	
none	Ruf

Edges fair to good

The thicker the Varnish the more wrinkles, must get the trick to stop them surfaces appear to improve thicker the Var but wrinkles increase again.

1-20-16

46 E

Make 50 plates with Reg Varnish but use 55 cc of Varnish

Transfer 12

Print 6 1293 blank

Trfd 12 12 OK
6 print
5 OK
1 slight poor print on margin
Cohac

Flowed all OK Looks good

Over all worry 16 plates without wrinkles 34 with wrinkles

Note thick Var Makes wrinkles

RO	Fine
1	
2	good
3	
4	fair
5	
6	
none	Ruf

No better than 46E

Think 55 CC best if wrinkles Can be got out, 50 will do but 55 is ideal if wrinkles got out —

Looks as if 50 CC best

Thicker plate above the wrinkle

1—19—16

47E

Make 50 plates regular Varnish but use 60CC

Transfer 12 1293 blank Dropped
Print 6

Transfd 12 120K
Print 6 6 OK —

Var plate flowed all OK look good
Baked plates 6 plates without wrinkles 40 with wrinkles all wormy

Note Wrinkles comes on thick Varnish

Isobutylxylol	27	minutes
Isoeugenol	248	"
Phenylhydrazin	141	"
Xylidin	88	"
Monochlorophenol	69	"
Camphor oil	271	"

Notes –

Used 3 cc each poured out in white butter dish – put right on hot plate

	Benzaldehyde all evap in	18	min
oil	Pine Needles "	23	"
"	Eucalyptus "	7	"
"	Lavender "	10	"
"	Origanum	8	"
"	Sassafras	48	"
	Safrol	47	"
oil	Cedar Wood	120	"
	Rosin Oil		
	Nujol	Dont evap	
	Camphor Oil		
	Monochlorotoluol	10	"
	Pentachloroethan	12	"
	Orthochloroaniline	38	
	Perchloroethylen	9	
	Trichloroethylene	4	

I think the shellac gets so finely divided that it oxidizes only Charcoal + Chalk + becomes brittle.
Some other resin of high MP might do better than shellac

Note —

Different fibres + powders for blanket Experts

	Powder
Mineral Wool	Cork Magnesia
Short fibre Asbestos	China Clay
Cotton flock	Clay
Cow-hair	Starch —
Straw	Fuller Earth
Ground Cork	Siliconite
	Infusorial Earth

1307 23E 4 to 1 Lac 3 check Moulded 20 lbs
pressure 538 blanks 100% OK
1308 24E 4½ to 1 1½ ground blank 20 lbs
97 made 100% OK
1309 26E 3 to 1 Lac 4 check 86 made 100%
no pressure 100% OK
no strike off – Powder showed cracks with
20 lbs pressure Blanks very soft – break away

1310-27E 2 to 1 Lac 5 check no pressure
80 blanks 100% no strike off
showed cracks with 20 lbs pressure
Blanks very soft break away

1311 28E 1 to 1 – 6 check
no pressure 103 blanks 100%
no strike off powder showed crack
with 20 lbs pressure, very soft
break away

1312 29E 5 to 1 Lac 2 check moulded
20 lbs pressure 66 blanks 100%
Blanks soft spongy break away

1314 31F 3 to 1 Lac 4 Charcoal
20 lbs pressure 109 blanks
77% blanks very soft + spongy
Discards Crumbled Edges

1315 - 32F 2 to 1 Lac 5 Charcoal
50 lbs pressure 45 blanks
57% OK Blanks very soft +
spongy Discards Crumbled Edges
+ break when stretching

1314 + 1315 - LOEut on fire in Dryer
at temp 218 Fahr

48E		11 OK
RO 1	fine	
1	good	
2		
3		
4	fair	
5		10 OK
6		
None	Rup	

Req Var
12 Transfer
10 OK
2 machine defects

6 Prints
1 OK
5 poor prints

Hoffman Number 1328,
Very good LOEU

These blanks are OK for everything Except poor prints + Edges which crumble rather bad —
guess P Prints be stopped by blank pressure reduced to 500 lbs + Edging back 1/8" more

48E 1-20-16 BOSS

ground fine 89% thru 180
.72 hardness
Crusher 48E 68% thru 180

2 Wood 5 Chalk
2 Shellac,

for RO + surfaces - think it would blend sharp + for strength + with Dehydrated Resin + low LH + making blanks fine + blank sharp

Make 45 to 80 blanks
Dup ~~[illegible]~~ blank for test —

~~[illegible]~~ Make 12 Transfers
Moulded 20 lbs pressure in 6 pound
Small press 107 moulded 100% good
Powder hard cakes like set Cement when
Taken from the press, Cuts like a soft blank
had to be broken up by hammer before
grinding so later would take it
Blanks thin ~~at~~ less + think than reg - 1/32
~~These moulded~~ up best looking
blank we have made so Hoffman says
face of blank looks to me as if
powder not ground fine Enough
think too much Lac = Lily - guess not
gauge 225 weight 444

RO 1 fine
1 ~~||||~~
2 |
3 ||
4 | fair||||
5 ||
6
none Ruf ~~||||~~ || NG

Very Mottled -
~~Very~~ Poor Edges -
fair weld - Little Checker Clean
@ Tandard,

Blanks Hofman 100%

49 E
4 wood 3 Charcoal 1 1/4 Lac

12 Transfer 12 OK Dupped Reg Var
6 prints 6 OK
Hoffman # 1329

RO Fair ~~IIII~~ IIII
1
2 good IIII
3
4 fair
5 |
6 ~~IIII~~ IIII
None III Ruff

Dont weld good as blank pulls off easy
Edges poor Crumble

Hofm blank % 98.7

50 E

4 wood 3 Charcoal 1 ½ Lac

Transfer Reg Van
Dropped
Transfer 12 Tran 12 OK
6 present 6 OK

RO 1 fine ~~IIII~~ 1
1 ||
2 1 good |||
3
4 ||
5 ||
6 |||
n 1 Rough ||

Blank has much finer grain than orig blank few big holes

good weld -

Adding more shellac gradually improves blank

Think wants more lac

Edges Crumbly - breakaway

Wants 2 lac final 2.25 lac

Heffron blanks % 100

51 E

4 wood 3 charcoal 1 3/4 lac

Transfers used Ray Van Dripped

Note Cracked

Transfers 12
10 OK
3 Dis Cracked

6 percent 6 OK

Note discordant results RO + surfaces
49 50 + 51

Something wrong somewhere

RO Fine ||||
1
2 good
3
4 fair
5 |
6 |
none || Ruf

Blank not as smooth as 51

Edges all Crumbled out

Varfeels very easy

Blank seperates / thick

to Vari —

Hofman 100yd

52 E

3 Wood 4 charcoal 1½ Lac

Transfers Reg Vari
Dipped blank

12 Transfers
2 ok
10 - Ckd Vari — note Cracks

2 print 2 ok

1 chipped out after forming

Cracks in Music

Extraform 1

RO	
1	Fine ~~IIII~~ IIII
2	good II
3	
4 II	Poor
5 III	
6 IIII	
none III	Ruf

Edges Slightly Crumbled

Welds fair -

Hoffman 100%

53 E

3 wood 4 Charcoal 1 3/4 Lac

Transfd Reg Veer
Reg Sch

Transfd 12
11 ok 1 ck) Note Cracks

Trent, 6 ok

RO	fine IIII
1	
2 I	good III
3 I	
4 IIII	fair III
5 I	
6 II	
None III	Ref II

Blank fairly fine grain

Welds good - but blank pulls off -

Edges Crumbly

Hoffman 100

54 E

3 wood 4 charcoal -

~~3 charcoal~~ 2 Lac

Transfer decig Var
Dipped

12 Trans 12 OK

6 permit 6 OK

Koffman 100%

55 E

.7 Chalk. 2 Lac

Dip run reg

Make 12 Transfers
6 prints

All blanks cracked + which
to plate on transferring
12 Transfers
too brittle no give must
have fibre

RO

1
2
3
4
5
6
7 None

Fine ||||
good
fair
Rough

Surfaces
Perfect

In transferring whole blank
Sometimes Crack clear
thru

Only welds to dipping Var
+ this + veneer come off together
because dipping Var not
thin enough to penetrate
Heffner 81% dehydrate + clinch
more of the blank

56 E

To work this blank
must have nearly
pure dehydrated rosin no
other stuff except perhaps sandrac + 6/11 4-
Pour

3 Charcoal 4 chalk

2 Lac

to get very low contraction
Even the 2 Lac dont save Varnish

Transfer Reg V Reg S

Transfer 12 - 20k 10 do
Prints 6 - 20k - both
no contraction
Notice terrible Cracks
both J + Pl's.

Note this —

Must have fibre
its like 55 E no fibre

I flowed some regular Var over 48E to see if we could print direct to do away with Transfers —

A 300 lbs

RO	fine
1	
2	good
3	
4	fair
5	
6	Weld good
None	Ruf

B

RO	fine
1	
2	good
3	
4	fair
5	
6	
None	Ruf

Weld good 2-3-4

C

RO	fine
1	
2	good
3	
4	fair
5	
6	
None	Ruf

Weld good 2-3-4

D

RO	fine
1	
2	good
3	
4	fair
5	
6	
None	Ruf

E

RO	fine
1	
2	good
3	
4	fair
5	
6	
None	R

57 E Mistake wrong press
These pressures are on small press
Duplicate 48E molded off fine
But do not use more than press
~~500 lbs pressure on press~~ 1400 pressure big press
pressing Try a dozen
each at 300 A 400 B
500 C + 600, D + 800, E,
Mark each

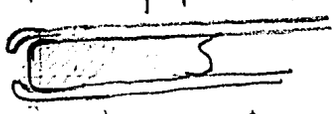
Molded on small press following pressures — 300 400 500 600 800 1000 lbs on big press — Man made a mistake — all 100%

A { Transfer 12 11 ok 1 Ckd
Print 6 - 5 ok 1 poor print
good weld - Edges crumbled - Strange

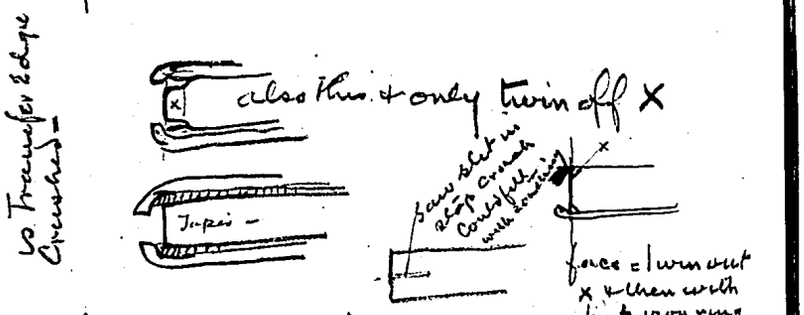
B { Transfer 12 6 ok. 6 Left Ckd
Print 6 - 5 ok in print on margin -

C { Transfer 12 12 ok
Print 6 - 5 ok 1 poor print

1 = Try rounding 2 wood stick to have to give good Edges



Extra Condensite gives too much pressure
See average overburden of Varnish there + round it to Correspond - get up a tool. This will clinch Var as well



See what chemical will increase solubility of 6/4 when alcohol is evap (ie) will of itself be a powerful solvent for 6/4 so when alcohol is evap it will not segregate but be kept distributed in the liquid solvent + act evenly

Is Acetylcellulose Sol in Alcohol with aid of another solvent ~~for~~ Try it.

Acetylcellulose Sol in Chloroform
Epichlorohydrin - glacial acetic
Myrbane Some sol in Acetone
+ Acetic Ether, Ethane Tetrachl

Also try Celluloid, its Sol alc + Eth, Acetone
if it decomposes it leaves a fabric in the Condensite Var

Grind the asbestos fibre up very fine so goes through 30 + 50 mesh

See if 6/4 solin Melted Naphthalene.

Try those Very weak Reg V sol with much alcohol on bottles check Condensed Very gradually + see if they will really Condense - Important. Will 6/4 Condense in presence of much water

Find out what blank used when we were 90% Transfer + also Cracks + then what was done

Look for my Books of beg Var Expts at Lab my desk etc

Get 500 lbs Asbestos.

[ITEMS(S) FOUND IN BOOK]

Form 1195

Transfered 1/26/16

EXPERIMENTAL

MOORE

POWDER BLANK TRANSFER INSPECTION

1256

Var. Lot No. 94

Blank No. 1297 Pow C450

Oven No. 13-14

Total Transferred	789
Total O. K.	608
Total Discarded	181

NATURE OF DISCARDS

Cooked Centre	
Lift Cracked	
Lift Cracked on one edge	
Lift not cracked	
Thin Margin (Black on opposite side)	
Thin Margin (Red on opposite side)	
Pull Out	
~~Birds~~ Holes	2
Cracked Waves	
Cracked Varnish	130
~~Mechanical Defect~~ chipped	49

77%

[ITEMS(S) FOUND IN BOOK]

Form 765 1256 Wan. Lab 94 1497 Bek- 450 MOORE Date 7/28/56

FINAL RECORD TEST

Knocks	Crackel	Run Out	Rough Surface	Cracks	Poor Prints	Bad Labels	Scratch	Wrong Combination	White Spots	Holes	Bad Centre	Cuts			Total
		18		9	5			Reg Clearstone							
		33		10	3										
		49	1	21											
		100	1	40	8										149

Number of Records Discarded 149

" " O. K. 459

TOTAL Records Tested 608

" " on Hand

" " Received

75% OK

Tester.

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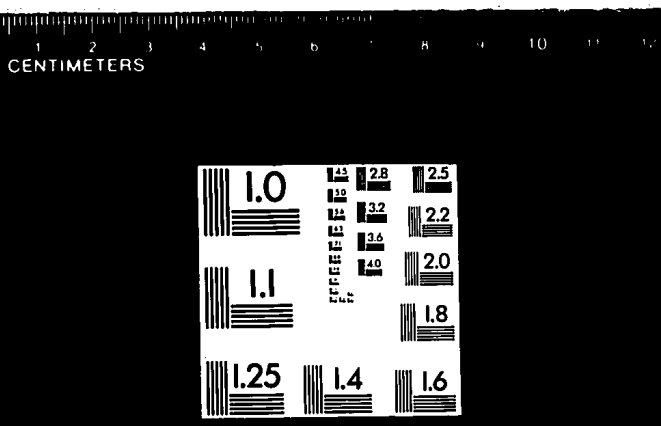

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